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Technical Report

Project Description

Prepared for
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November 1980

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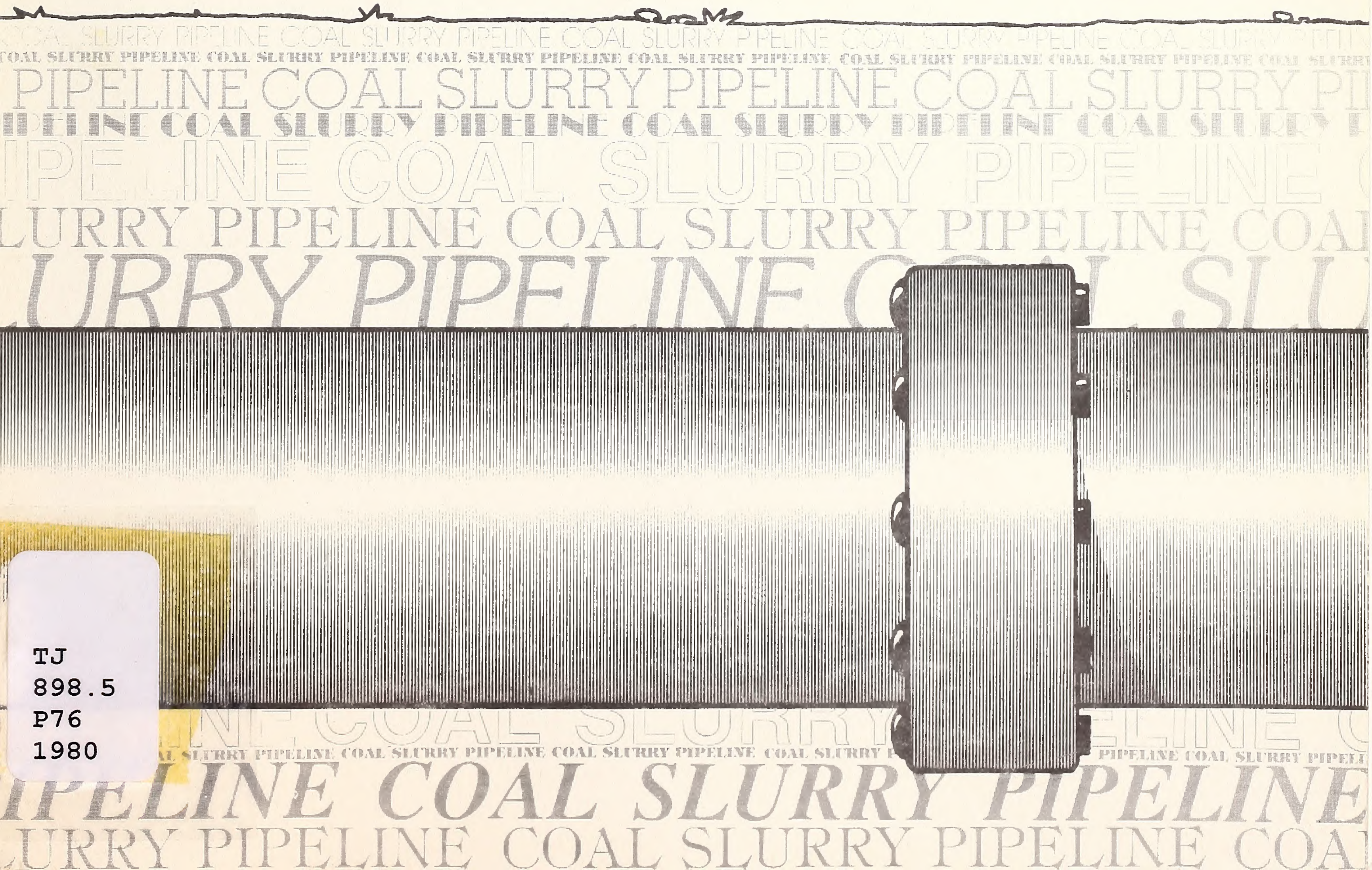
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PROJECT DESCRIPTION
TECHNICAL REPORT

for the

ETSI Coal Slurry Pipeline Project

November 7, 1980

Prepared by Woodward-Clyde Consultants for
U.S. Department of Interior, Bureau of Land Management

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CHAPTER 1

PROPOSED ACTION

1.A GENERAL DESCRIPTION

The proposed coal slurry transportation project would consist of four major operating facilities: (1) coal slurry preparation plants, (2) main and reserve water supply system, (3) coal slurry pipelines and pump stations, and (4) coal slurry dewatering plants. These facilities are shown conceptually on Figure 1-1.

Three coal slurry preparation plants would receive coal from six mines in the Powder River Basin of northeastern Wyoming. The coal would be crushed at these Wyoming plants and mixed with water to form a slurry for transport by pipeline. The mixture would be approximately half water and half coal, by weight. Approximately 20,500 acre-feet per year of water would be required for the transportation project. Most of this water would be obtained from a well field developed in Niobrara County, Wyoming. Small amounts would be obtained from wells at slurry pump station sites. In addition, some water may be purchased from the city of Gillette, Wyoming.

The coal slurry would be transported through approximately 71 miles of gathering pipelines to the main slurry pipeline, which would extend approximately 1664 miles through Wyoming, Nebraska, and Kansas to receiving terminals at power plants in Oklahoma, Arkansas, and Louisiana (Map 1-1). Table 1-1 shows the coal delivery schedule for the nine terminals. Each receiving terminal would include a dewatering plant for separating the coal from the transport water. Strip maps showing the project are provided in Appendix A of the EIS.

1.B WATER REQUIREMENTS

The primary water requirement for the proposed coal slurry pipeline project would be that needed to transport the coal. The total system require-

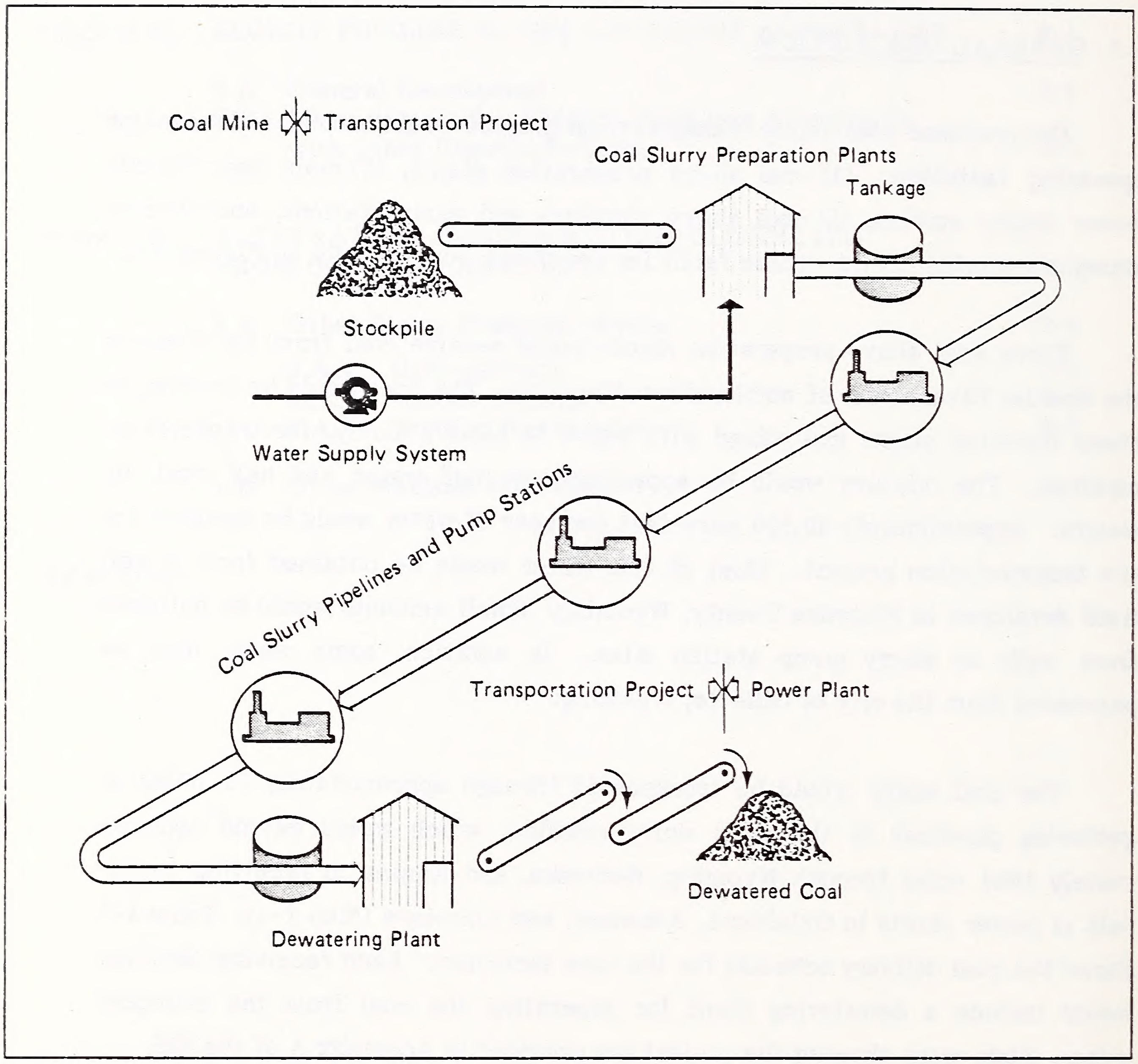
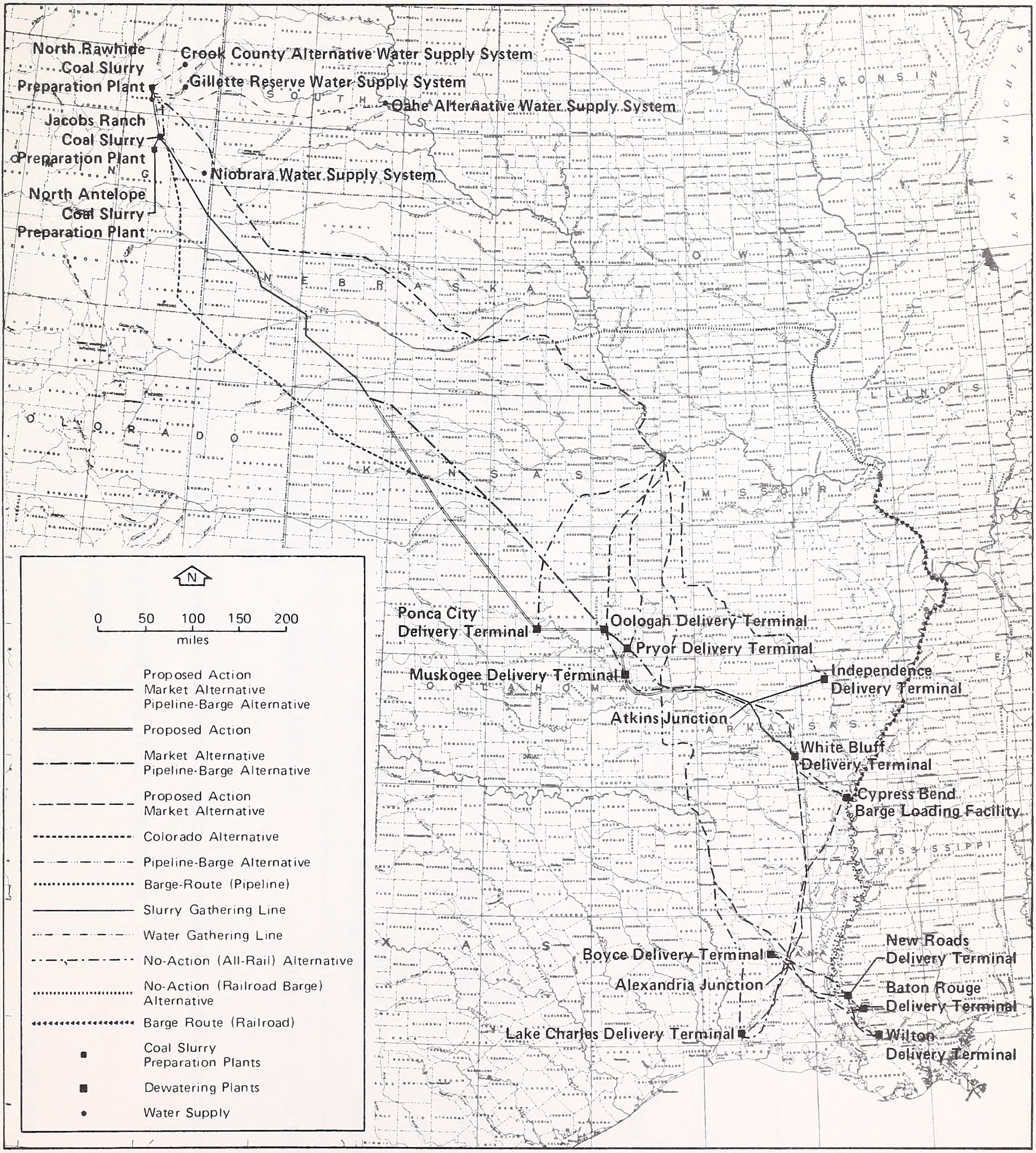


Figure 1-1. CONCEPTUAL DESCRIPTION OF COAL SLURRY TRANSPORTATION PROJECT


North Rawhide Coal Slurry Preparation Plant
Crook County Alternative Water Supply System
Gillette Reserve Water Supply System
Oahe Alternative Water Supply System
Jacobs Ranch Coal Slurry Preparation Plant
Niobrara Water Supply System
North Antelope Coal Slurry Preparation Plant
WISCONSIN
LAKE MICHIGAN
IOWA
NEBRASKA
ILLINOIS
COLORADO
KANSAS
MISSOURI
Ponca City Delivery Terminal
Oologah Delivery Terminal
Pryor Delivery Terminal
Muskogee Delivery Terminal
OKLAHOMA
Independence Delivery Terminal
Atkins Junction
ARKANSAS
White Bluff Delivery Terminal
Cypress Bend Barge Loading Facility
MISSISSIPPI
TEXAS
Boyce Delivery Terminal
Alexandria Junction
New Roads Delivery Terminal
Baton Rouge Delivery Terminal
Lake Charles Delivery Terminal
Wilton Delivery Terminal
N
0 50 100 150 200
miles
Proposed Action
Market Alternative
Pipeline-Barge Alternative
Proposed Action
Market Alternative
Pipeline-Barge Alternative
Proposed Action
Market Alternative
Colorado Alternative
Pipeline-Barge Alternative
Barge-Route (Pipeline)
Slurry Gathering Line
Water Gathering Line
No-Action (All-Rail) Alternative
No-Action (Railroad Barge) Alternative
Barge Route (Railroad)
Coal Slurry Preparation Plants
Dewatering Plants
Water Supply

Map 1-1. LOCATION AND GENERAL ARRANGEMENT OF PROPOSED COAL SLURRY TRANSPORTATION PROJECT AND ALTERNATIVES

TABLE 1-1

PROPOSED COAL DELIVERY SCHEDULE: PROPOSED ACTION

Preparation Plant	Mine	Delivery Terminal	Distance from Mine (miles)	As-Mined Coal (MMTA)				
				1985	1986	1987	1988	1989
North Rawhide	North Rawhide	Pryor, Okla.	862	1.5	3.0	3.0	3.0	3.0
	Buckskin	New Roads, La.	1445	2.0	2.0	2.0	2.0	2.0
Subtotal				3.5	5.0	5.0	5.0	5.0
Jacobs Ranch	Black Thunder	Ponca City, Okla.	700	3.3	5.0	6.6	6.6	6.6
	Black Thunder	Muskogee, Okla.	842	5.0	5.0	5.0	5.0	5.0
	Jacobs Ranch	White Bluff, Ark.	1078	5.0	5.0	5.0	5.0	5.0
	Jacobs Ranch	Boyce, La.	1339	1.8	1.8	1.8	1.8	1.8
	Jacobs Ranch	Lake Charles, La.	1404	4.0	4.0	4.0	4.0	4.0
Subtotal				19.1	20.8	22.4	22.4	22.4
North Antelope	North Antelope	Independence, Ark.	1106	5.0	5.0	5.0	5.0	5.0
	Antelope	Wilton, La.	1473	-	-	2.5	2.5	5.0
Subtotal				5.0	5.0	7.5	7.5	10.0
Total				27.6	30.8	34.9	34.9	37.4

ment for water is 20,500 acre-feet per year of which approximately 20,000 acre-feet per year obtained from the Madison Formation would be required to transport 37.4 million tons annually (MMTA) of coal from Wyoming.

Two hundred acre-feet per year obtained from the Madison Formation would be required at the preparation plants to make up for evaporation from the storage ponds, and for domestic water, dust suppression, plant washdown, and other uses not connected with slurry.

Three hundred acre-feet per year obtained at local wells at pump station sites would be required for evaporation makeup at pump station storage ponds. (See pump station discussion in Section 1.G.3. for a more detailed description).

On February 21, 1974, in Enrolled Act No. 10, the Forty-Second Legislature of the State of Wyoming gave approval to ETSI to appropriate ground water for use outside Wyoming, subject to approval of the State Engineer. Certain major conditions were required to be met. In brief, the act provided for the following:

- No more than 20,000 acre-feet of water could be exported annually from the state for use in the pipeline.
- The water could be withdrawn only from wells in the Madison or Bell Sand formations and from depths greater than 2500 feet below the ground surface.
- Pumping would not interfere with the existing beneficial water users in Wyoming.
- The wells must be properly constructed to prevent water from moving along the outside of the well casing.
- If ETSI lowers water levels for other users of appropriated water in Wyoming, ETSI may be required to compensate each injured water user by deepening the user's well and paying the additional costs of pumping; providing the person with an amount of suitable water equal to the amount available prior to ETSI's pumping operation; or finding another water source.
- The Wyoming State Engineer can terminate the appropriation if ETSI's operation endangers or will endanger the existing water table.

In September 1974, the Wyoming State Engineer granted permit numbers U-W 27854 through U-W 27893 for 40 wells at the site of the Niobrara well field. Nineteen conditions and limitations were incorporated into each permit. The major ones are described below:

- On an average annual basis, 15,000 acre-feet of water could be pumped from the well field, with no more than 20,000 acre-feet pumped in any one year, averaged over a 20-year period. In addition, if requested by ETSI, and upon showing that additional water may be withdrawn and used from the Madison Formation without interference, the state engineer may permit ETSI to take more than 20,000 acre-feet of water per year.
- No more than 300,000 acre-feet of water could be pumped in a 20-year period.
- Five monitoring wells must be installed and monitored for at least one year before the well field begins operation. One of these five monitoring wells was drilled in 1978.
- Monitoring or measuring devices may be required on each production well, as determined by the state engineer, with monthly reports for five years on these well discharges and on the five monitoring and observation wells.
- Production tests and inspections may be required, and geophysical logs must be run for each production well.
- The well permits were granted subject to cancellation at the end of the 50-year period following the first production of water from the ETSI production wells, with the provision that ETSI and the state engineer may mutually agree to extend such cancellation date.
- The limitations on the amount of water withdrawn, the restriction to the Madison and Bell Sand formations, and the remedies for injured water users (resulting from lowering of the water table) were similar to those described in Enrolled Act 10.
- Further protection was provided to Wyoming water users by an agreement dated September 24, 1974 entered into between the state engineer and ETSI, which extended and expanded the protection granted by the legislation and the well permit limitations. Among other things, the agreement required that funds would be available to cover any costs incurred under the terms of the agreement.

In addition, as further protection, the city of Edgemont, South Dakota, the closest municipality to ETSI's well field, passed a resolution on July 8, 1974 accepting ETSI's offer to install an observation well for the city. The terms and conditions are as follows:

- ETSI will construct the observation well in Niobrara County, Wyoming at least one year prior to production.
- Title to the real estate will remain in Edgemont and title to all personal property in the form of pipes, casings, pumps, valves, and other assemblies essential to the operation of the well will be transferred from ETSI to the City of Edgemont upon completion of the well.
- ETSI will be responsible for all installation costs of the well and in addition thereto will satisfy costs necessitated by the ETSI scientific information and data accumulation process while ETSI uses the well as an observation well.
- ETSI will also be responsible for any operating costs of the well necessitated by the effects of the ETSI project in Niobrara County, Wyoming.
- ETSI will be given a permanent use of the well by Edgemont for the purpose of obtaining scientific data or information and Edgemont will grant ETSI an easement for ingress and egress to the well site for purposes of maintaining the facility or gathering scientific data or information.
- Edgemont will provide ETSI with a suitable well location site.
- ETSI agrees that the pumps to be installed will be a least two hundred feet below the present drain down level of the Edgemont wells in the Madison Formation.

A reserve source of water may be available from the Gillette water supply system. A memorandum of understanding exists between ETSI and Gillette in which, after negotiation of an agreement, (a) the city would produce and deliver to ETSI all water in excess of Gillette's needs and other prior commitments up to the full designed capacity of the system, (b) the city would supply ETSI with a minimum of 4000 acre-feet of water each year from 1983 through 2013, provided, however, that Gillette would designate the times at which this water would be made available and exercise its right to make this water available at nonpeak load times.

The obligation of Gillette to supply a minimum of 4000 acre-feet per year would be subject to certain stipulations to be defined in the agreement.

Storage pond makeup water that would be required at the slurry pump stations would be drawn from wells drilled at the facilities, except for three in Wyoming, which would use makeup water obtained from the Niobrara well field. The amounts required in each state are shown in Table 1-2. No makeup water would be needed at stations in Arkansas and Louisiana because rainfall is greater than evaporation in those locations. Domestic water requirements would be negligible. Domestic water would be obtained from local wells or local water sources, where available. Table 1-2 also lists other water requirements not related to transportation of the slurry.

1.C ACREAGE REQUIREMENTS AND LAND STATUS

The complete coal slurry transportation project would involve 1,828 miles of right-of-way for water and coal slurry pipelines. During construction of the project, approximately 22,730 acres would be disturbed. Of this amount, approximately one percent is federally controlled. Table 1-3 shows the land status for this system. Of the total disturbed acreage, approximately 21,777 right-of-way acres would be reclaimed following construction, including reseeding when required by the land owner or surface management agency.

1.D GENERAL CONSTRUCTION, OPERATING, AND RECLAMATION PROCEDURES

Construction and operation of the proposed coal slurry transportation project would involve well-drilling operations, pipeline installation, and construction of numerous aboveground facilities, including coal slurry preparation plants, pipeline pump stations, slurry dewatering facilities, communications networks, electric power transmission lines, and maintenance bases. Standard or general practices are discussed here, and detailed procedures for specific facilities are discussed in Section 1.G.

TABLE 1-2

WATER REQUIREMENTS: PROPOSED ACTION

Use	Amount (acre-feet)	Source	Where Used
Annual Requirements			
Coal transport medium	20,000	Niobrara County well field	Exported from Wyoming
Preparation plant storage pond evaporation makeup, dust suppression, plant washdown	200	Niobrara County well field	Preparation plants (Wyoming)
Pump station storage pond evaporation makeup*	(state totals)		
	60	2 local wells	Wyoming pump stations
	85	2 local wells	Nebraska pump stations
	105	2 local wells	Kansas pump stations
	50	3 local wells	Oklahoma pump stations
Subtotal	300		
Total	20,500		
Construction Requirements (total for project)			
Water-well drilling operations	112	Niobrara County well field	Wyoming
Fugitive dust control, concrete		Vary with construction location	Various construction locations
Pipeline hydrotesting	1,650	Local sources	Various locations along pipeline
Initial packing of pipeline, filling of pump station storage ponds	2,535	Niobrara County well field	Exported from Wyoming

*Domestic water requirements would be negligible. Domestic water would be obtained from local wells or local water supply systems, where available.

TABLE 1-3

LAND STATUS AND ACREAGE: PROPOSED ACTION

State	Pipeline Segment	Total Miles	Right-of-Way										Surface Facilities[c] All Private Acres	Total Acres
			Private		Federal				State		Indian			
					Forest Service		BLM							
			Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]		
Wyoming														
	N.R.-J.R. (slurry & water)	55	46	558	4	48	1	12	4	48	-	-	40	706
	N.A.-J.R. (slurry & water)	16	6	73	9	109	-	-	1	12	-	-	65	259
	J.R.-WY/NE Border (slurry)	102	82	994	14	170	2	24	4	48	-	-	180	1,416
	Niobrara Well Field	62	62	376	-	-	-	-	-	-	-	-	125	501
	Niobrara-J.R. (water)	68[b]	28	340	-	-	3	36	-	-	-	-	3	379
	Subtotal	266	224	2,341	27	327	6	72	9	108	-	-	413	3,261
Nebraska														
	WY/NE Border-NE/KS Border	275	258	3,127	-	-	-	-	17	206	-	-	50	3,383
	Subtotal	275	258	3,127	-	-	-	-	17	206	-	-	50	3,383
Kansas														
	NE/KS Border-KS/OK Border	273	261	3,163	-	-	-	-	12	145	-	-	50	3,358
	Subtotal	273	261	3,163	-	-	-	-	12	145	-	-	50	3,358
Oklahoma														
	KS/OK Border-Ponca City	49	221	2,679	-	-	-	-	16	194	18	218	10	3,101
	Ponca City-Pryor	108	-	-	-	-	-	-	-	-	-	-	35	35
	Pryor-Muskogee	34	-	-	-	-	-	-	-	-	-	-	35	35
	Muskogee-OK/ARK Border	64	-	-	-	-	-	-	-	-	-	-	25	25
	Subtotal	255	221	2,679	-	-	-	-	16	194	18	218	105	3,196
Arkansas														
	OK/ARK Border-Atkins Junc.	93	92	1,115	-	-	-	-	1	12	-	-	25	1,152
	Atkins Junc.-Independence	93	92	1,115	-	-	-	-	1	12	-	-	60	1,187
	Atkins Junc.-White Bluff	80	79	957	-	-	-	-	1	12	-	-	10	979
	White Bluff-ARK/LA Border	102	99	1,200	-	-	-	-	3	36	-	-	50	1,286
	Subtotal	368	362	4,387	-	-	-	-	6	72	-	-	145	4,604

TABLE 1-3 Concluded

State	Pipeline Segment	Total Miles	Right-of-Way										Surface Facilities[c] All Private Acres	Total Acres
			Private		Federal				State		Indian			
					Forest Service		BLM							
			Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]		
Louisiana														
	ARK/LA Border-Alex. Junc.	136	134	1,624	-	-	-	-	2	24	-	-	50	1,698
	Alexandria Junc.-Boyce	24	23	279	-	-	-	-	1	12	-	-	35	326
	Alex. Junc.-Lake Charles	89	87	1,054	-	-	-	-	2	24	-	-	35	1,113
	Alex. Junc.-New Roads	76	74	897	-	-	-	-	2	24	-	-	10	931
	New Roads-Wilton	66	65	788	-	-	-	-	1	12	-	-	60	860
	Subtotal	391	383	4,642	-	-	-	-	8	96	-	-	190	4,928
	Total	1,828	1,709	20,339	27	327	6	72	68	821	18	218	953	22,730

Note: All numbers are rounded to nearest whole number.

[a] Construction acreage shown; acreage is based on a 100-foot-right-of-way for private, federal, state, and Indian lands. Water gathering lines within Niobrara well field require a 50-foot wide construction right-of-way.

[b] Main water and water distribution lines adjacent to slurry lines except for about 31 miles of total.

[c] Transmission lines and microwave towers not included due to insignificant amount of acreage required.

Legend:

N.R. - North Rawhide
OK - Oklahoma
J.R. - Jacobs Ranch
ARK - Arkansas
N.A. - North Antelope
LA - Louisiana
NE - Nebraska
Alex. - Alexandria
KS - Kansas
WY - Wyoming

1.D.1 SITE SELECTION

The location of the rights-of-way and systems facilities involved consideration of current land use patterns and environmental factors. For example, wherever feasible the pipeline route would follow existing or planned right-of-way corridors. Where new right-of-way corridors and system facilities would be located, the impacts of the installation would be fully considered. Emphasis would be placed on selecting locations where the right-of-way and facility structures would result in minimal impact to the landscape and vegetation and would be least noticeable from critical viewing areas.

1.D.2 EQUIPMENT DESIGN

The design of all components of the proposed coal slurry transportation project would include an awareness of the need for energy conservation, emission control, noise suppression, safety, impacts on visual resources, and the use of existing roadways, rights-of-way, and transmission lines wherever feasible. All structures and foundations would also be designed to withstand seismic forces that might be expected in the region. To avoid or reduce the impact of landslides, either natural or those caused by the proposed action, the following measures would be implemented:

- Project facilities would not be located on known or mapped landslides.
- Project facilities would not be located in known areas with a high potential for landsliding.
- Project facilities would not be located in known areas with highly unstable soils.
- Oversteepening or undercutting of existing natural slopes during development and construction would be avoided wherever feasible.
- Engineering solutions to reduce possible landsliding potential and impacts would be implemented.

Visual resource impacts would be minimized by locating and designing facilities so they would create minimal site disturbances and very little contrast with the existing landscape. Structural materials and configurations would repeat the forms, lines, colors, and textures of the surrounding landscape.

Equipment design would be in compliance with all standard codes, practices, and regulations. Safety of the work force would be given full consideration, with protective devices and operating manuals provided for each component.

In order to maintain continuity of operations, surface facilities would be provided with protection from the 100 year flood by taking the following steps:

- As far as possible, surface facilities would be located on high ground above know flood levels.
- Floor elevations would be set where possible above flood levels.
- Where flood levels are likely to be above floor level, surface facilities would be protected by dykes.
- In case of loss of a pump station the system would continue to operate at a reduced capacity.
- Dewatering plants would be located inside the power plant boundaries except for Cyress Bend and receive the same protection as the power plant. At Cypress Bend, flood protection measures, as indicated above, will be provided.

1.D.3 CONSTRUCTION

Standard construction procedures for all proposed installations would be followed and would include many measures designed to mitigate impacts, such as the following:

- Construction of pipeline river crossings would be timed to avoid fish spawning seasons and to avoid periods of high stream runoff.
- Fugitive dust would be controlled by wetting down areas as necessary.
- Vegetation and adjacent resources would be protected whenever possible.
- Natural drainage would be maintained.
- Sidehill bench cuts would be kept to a minimum.
- Construction on steep slopes would be avoided where feasible.

- On-site environmental coordinators and archaeologists would be employed during construction.
- Aboveground facilities would be painted in colors compatible with the surrounding landscape.
- Construction sites would be rehabilitated in an overall visually acceptable manner so that any changes would blend with the adjacent landscape.

1.D.4 EROSION CONTROL AND REVEGETATION

Standard procedures would include implementation of erosion control and revegetation measures to assure that lands disturbed by construction activities would be restored to a stable, productive, and aesthetically acceptable condition.

A detailed, site-specific reclamation plan would be developed prior to construction. Because the proposed project right-of-way is composed of many types of terrain, soils, vegetation, land uses, and climatic conditions, the detailed plan would include sets of techniques and measures tailored to each condition encountered. Local expertise and locally effective reclamation methods would be considered when the site-specific procedures for the detailed reclamation plan are developed.

Detailed information regarding applicable techniques and technical assistance to private landowners concerning erosion control measures would be obtained from the local soil conservation districts. Technical assistance for federal lands would be obtained from the BLM and the Forest Service.

During the construction phase of the project, an on-site reclamation specialist would be employed to provide: (1) liaison with private landowners, federal agency officials, and local governments; (2) expertise to direct applicable restoration procedures, when special conditions are encountered, without causing construction delays; and (3) favorable public relations.

General erosion control and restoration measures have been developed for right-of-way and site clearing, trenching and preservation of topsoil, backfilling and grading, land preparation for seeding and cultivation, revegetation, maintenance and monitoring, and use of biochemicals, as discussed below.

Right-of-Way and Site Clearing

Emphasis would be placed on the protection of existing vegetation and measures to minimize disturbance of existing environment.

- Land grading would be done only on the area required for construction.
- Existing ground cover such as grasses, leaves, roots, brush, and tree trimmings would be conserved. Tree limbs and trees not usable or merchantable timber would be stockpiled and later shredded and chipped for use in restoration operations or disposed of at the discretion of the landowner.
- Trees and shrubs on the right-of-way that are not cleared would be protected from damage during construction.
- Where the right-of-way crosses streams and other bodies of water the banks would be stabilized to prevent erosion. Construction techniques would minimize damage to shorelines, recreational areas, and fish and wildlife habitat.
- Care would be taken to avoid oil spills and other types of pollution in streams and other bodies of water and in their immediate drainage areas.
- Design and construction of temporary roads would ensure proper drainage and minimize soil erosion. Upon abandonment, roads would be restored to satisfaction of landowner and/or other regulatory officials.
- During adverse weather conditions, construction would be stopped when rutting or excessive tracking of soil and deterioration of vegetation occurs in the right-of-way area, as determined by the onsite reclamation specialist.
- During construction activities at preparation and dewatering plant sites, sedimentation (detention) basins and/or straw bale filters or other protective devices would be constructed to prevent suspended sediments from reaching downstream watercourses.

Trenching and Preservation of Topsoil

Trenching methods and techniques implemented would ensure that:

- Topsoil is removed from the trench area by double ditching (i.e., windrowed separately, protected, and replaced last during backfilling). This procedure would be followed unless otherwise specified by landowner or authorizing officer.

- Remaining unearthed materials are removed and stored in a manner that facilitates backfilling procedure, uses a minimum amount of right-of-way area, and protects the excavated material from vehicular and equipment traffic.
- Cofferdams or other diversionary techniques would be used where necessary to permit flow in one part of a stream while pipelaying construction occurs in another part.
- A specific trenching and excavated material stockpiling procedure would be used in steep-sloping and rough, broken terrain to ensure minimum disturbance.

Backfilling and Cleanup

The following backfilling and cleanup techniques would be used:

- Backfill would be replaced in a sequence and density similar to the preconstruction soil condition.
- Backfilling operations would be conducted in such a manner to minimize further disturbance of vegetation.
- The contour of the ground would be restored to permit normal surface drainage.
- In strongly sloping and steep terrain, erosion control structures such as water bars, diversion channels, and terraces would be constructed to divert water away from the pipeline trench and reduce soil erosion along the right-of-way and other adjoining areas disturbed during construction.
- All structures such as terraces, levees, underground drainage systems, irrigation pipelines, and canals would be restored to preconstruction conditions so that they would function as originally intended.
- The surface would be graded to conform to the existing surface of the adjoining areas except for a slight crown to compensate for natural subsidence. In cropland areas, especially border- and furrow-irrigated cropland, the crown would be smoothed to match the bordering area to allow surface irrigation.
- Topsoil would be uniformly replaced over the trench fill to restore productivity to its preconstruction condition.
- Materials unsuitable for backfilling or excess fill material would be disposed of in a waste area arranged by the landowner or other authorizing official.

Land Preparation for Seeding and Cultivation

Construction, backfilling, and cleanup activities may cause compaction and alter soil conditions that affect soil productivity and/or seeding success in the right-of-way area. The following practices and techniques would be used to improve these soil conditions, protect soil from erosion, and provide a favorable seedbed:

- In cropland areas, subsoiling or chiseling would be used, unless objected to by the landowner, to ensure that soil compaction is reduced and preconstruction soil permeability is restored.
- Chiseling would be used, unless objected to by the landowner, in rangeland areas to reduce compaction and improve soil permeability. Pitting and contour furrowing would be done on steeper slopes of disturbed areas to increase infiltration and to reduce runoff and erosion.
- Suitable mulches and other soil stabilizing practices would be used on all regraded and topsoiled areas where necessary to protect unvegetated soil from wind and water erosion and to improve water absorption.
- Special mulching practices or matting would be necessary in critical areas where wind and water are serious erosion hazards to protect seeding and seedlings after germination.
- Commercial fertilizers would be applied to soil areas with low inherent fertility to maintain crop yields and establish grass seedings. Application rates would be commensurate with annual precipitation and available irrigation water.
- Seedbed for areas seeded to grass would be prepared to provide a firm and friable condition suitable for the establishment of grass stands.
- Rock mulches would be used in steep-sloping rock outcrop areas to reduce erosion and promote vegetal growth.
- Cultivation and land preparation operations on steeply sloping areas would be done on the contour to minimize erosion.

Revegetation (Reseeding and Planting)

The loss of vegetation from lands disturbed by pipeline construction can be mitigated only by satisfactory revegetation. To ensure a successful revegetation program, methods and procedures would be consistent with local climate and soil conditions and would follow recommendations of local experts. Revegetation efforts would be continued until a satisfactory vegetative cover is established. The following practices and techniques would be used:

- A firm seedbed would be prepared prior to seeding. This would include a mulch of plant residues or other suitable materials. A cover crop may be needed in larger disturbed areas.
- Seed would be planted by drilling, broadcasting, or hydroseeding. Drilling is the preferred method, because it is usually most successful.
    - Drill seeding with a grass drill equipped with depth bands would be used where topography and soil conditions allow operation of equipment.
    - Broadcast seeding would be used for inaccessible or small areas. Seed would be covered by raking or harrowing.
    - Hydroseeding would be done in critical areas.
- Only species adapted to local soil and climatic conditions would be used. Generally these would be native species; however, introduced species may be considered for specific conditions when approved by the landowner and regulatory authority. Seeding rates in critical area plantings and generally throughout the right-of-way would be increased 100 percent over regular seeding rates to allow for seed mortality due to adverse growing conditions.
- Seeding would be done when seasonal or weather conditions are most favorable and as determined by the landowner or authorized agency official.
- Grazing or mowing would be delayed at least one season after seeding to provide time for vegetation to become established, especially in highly erodible areas, unless objected to by the landowner. Fencing may be necessary in special areas.

Maintenance and Monitoring

The right-of-way would be inspected to monitor the success and maintenance of erosion control measures and revegetation programs on native grazing lands for two growing seasons or for a period determined by the landowner on private land or the authorized agency official on state or federal land. The monitoring program would identify problem areas and corrective measures to ensure vegetation cover and erosion control. Certification of successful revegetation would be determined by the landowner or authorized agency official.

Use of Biochemicals

The use of biochemicals such as herbicides, fungicides, and fertilizers would comply with state and federal laws regarding the use of poisonous, hazardous, or persistent substances. Prior to the use of such substances on or near the permit or grant area, ETSI would obtain approval of a written plan for such use from the authorizing office, land owner, and appropriate wildlife agencies. The plan would outline the kind of chemical, method of application, purpose of application, and other information as required, and would be considered as the authorized procedure for all applications until revoked by the authorizing office, landowner, or appropriate wildlife agency. These substances would be applied by ground methods, and licensed applicators would be used where required.

1.D.5 OPERATION

Systems operation would include these standard practices:

- Compliance with all codes and regulations regarding personnel health and safety
- Development of operating manuals that detail safe operating procedures
- Use of proper fencing and warning signs around unsafe areas
- Development of contingency plans for use in emergency situations involving accidental spills
- The visual quality of areas rehabilitated after construction will be maintained.

1.E TIME FRAME

Construction of the proposed project would begin about January 1983 and continue in phases until 1989 (Figures 1-2 and 1-3). Operation would begin approximately in the middle of 1985 and continue for a projected 50 years, or until about 2035. The schedules presented in this EIS and used in establishing parameters for impact assessment are assumptions and are therefore subject to change.

FIGURE 1-2

ASSUMED PIPELINE AND PUMP STATION CONSTRUCTION SCHEDULE: PROPOSED ACTION

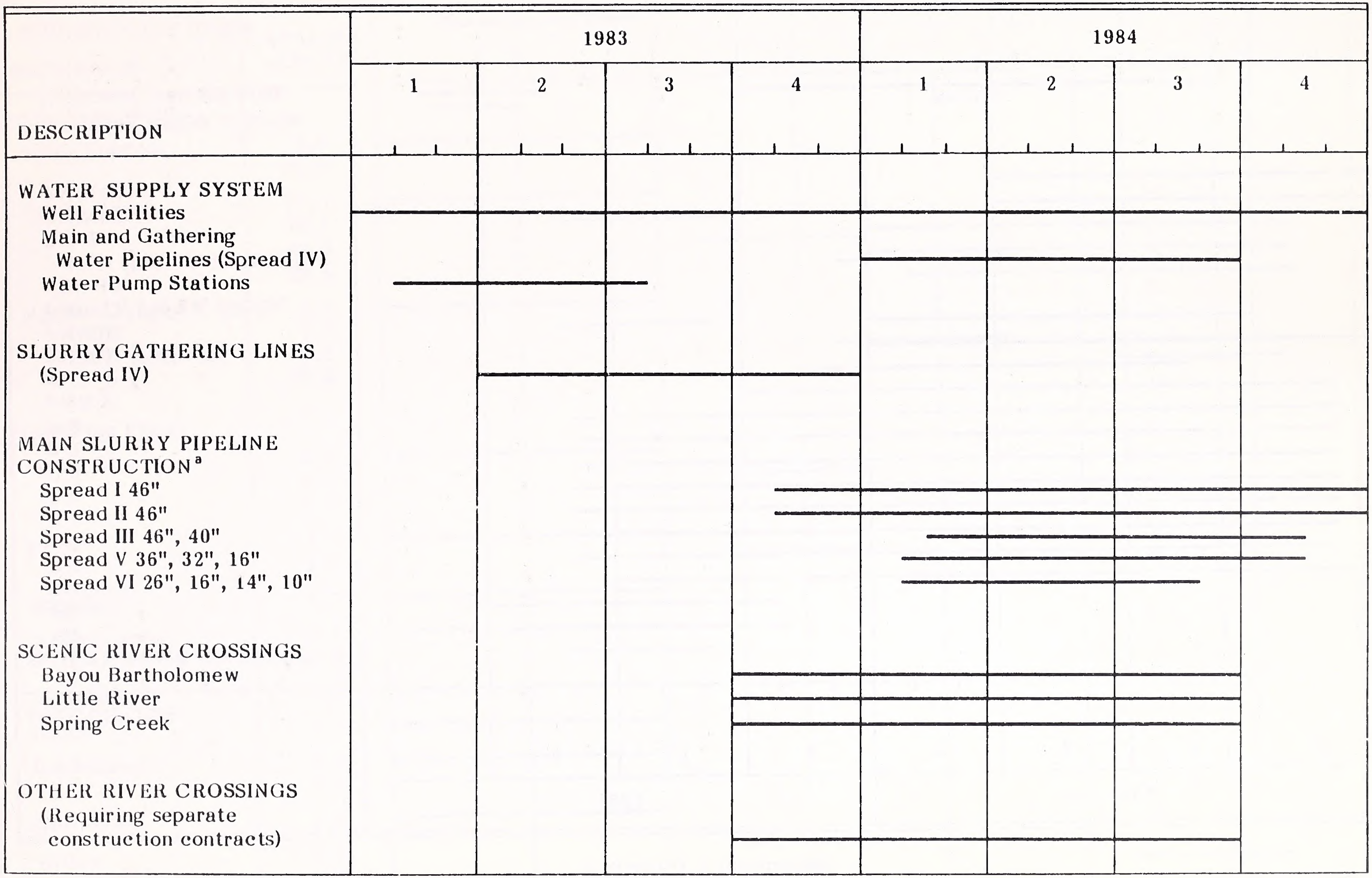
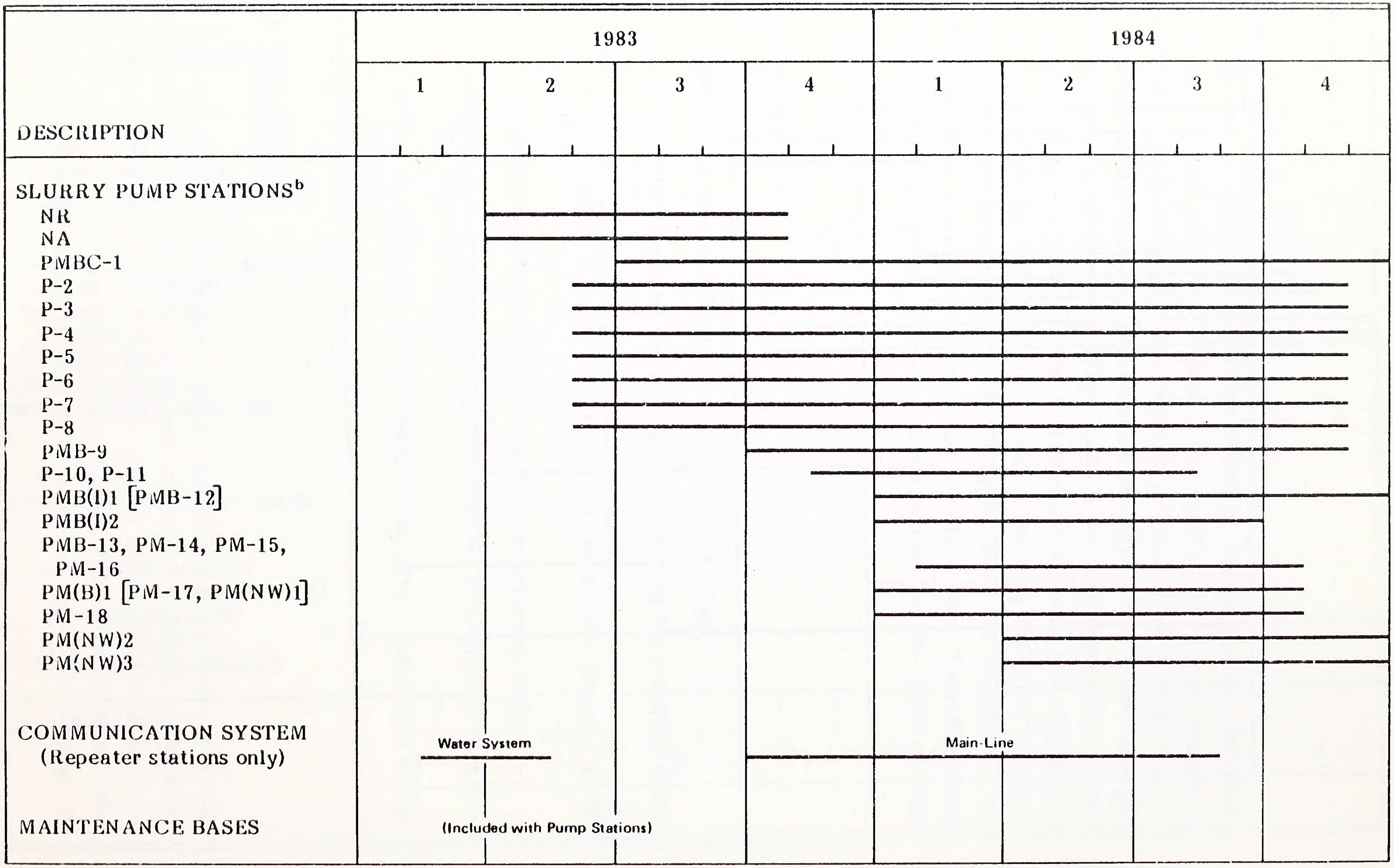


FIGURE 1-2 (concluded)



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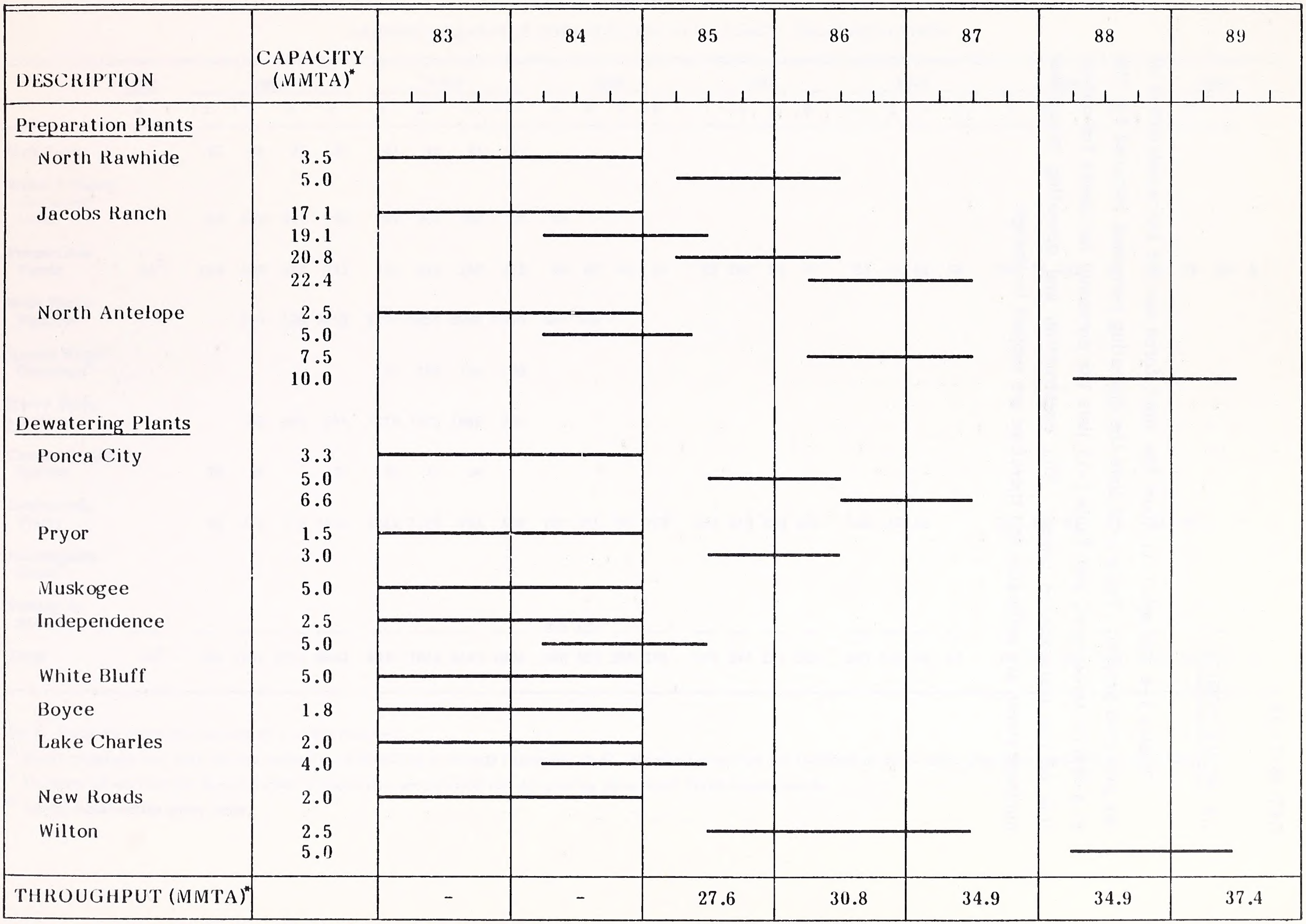
[a] See Table 1-8 for spread locations.

[b] See strip maps in Appendix A of the EIS for description of symbols and locations of pump stations. There are only 23 different slurry pump station locations; pump stations shown in brackets are at same location as first pump station listed in the row.

FIGURE 1-3

ASSUMED PREPARATION AND DEWATERING PLANTS CONSTRUCTION SCHEDULE: PROPOSED ACTION



* Millions of (short) tons annually

1.F WORK FORCE

Tables 1-4 through 1-11 show the work force needed for construction of the proposed project. Table 1-12 lists the operating personnel required for the 37.4-MMTA throughput, and Table 1-13 lists the personnel necessary for operation of the maintenance bases. The construction and operating manpower numbers shown are estimates and therefore are subject to change.

TABLE 1-4

ASSUMED QUARTERLY CONSTRUCTION WORK FORCE: PROPOSED ACTION

	1982	1983				1984				1985				1986				1987				1988				1989			
	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Well Field		41	41	41	41	41	41	41	41																				
Water & Slurry Gathering Lines		60	360	360	60	60	260	260	30	15																			
Preparation Plants	34[c]	129	189	259	342	402	440	338	202	66	83	95	57	81	107	91	92	93	61	58	33	20	26	21	49	56	25	18	5
Main Slurry Pipeline			100	500	2950	2950	2950	2950	2950	300	100																		
Special River Crossings[a]						150	150	150	150																				
Slurry Pump Stations			265	685	975	1870	1970	1680	945																				
Communication System		20	20		20	20	20	20																					
Dewatering Plants		58	378	726	1155	1332	1182	903	488	145	140	105	173	204	240	230	192	150	83	18		20	45	65	70	60	40		
Maintenance Bases[b]																													
Testing & Startup										260	260																		
Total	34[c]	308	1353	2571	5543	6825	7013	6342	4806	786	583	200	230	285	347	321	284	243	144	76	33	40	71	86	119	116	65	18	5

Note: Numbers represent number of workers required.

[a] River crossings that may require separate construction contracts (Appendix D-6). Standard crossings are included in main slurry pipeline construction work force.

[b] Numbers of workers are incorporated in respective preparation and dewatering plant work force requirements.

[c] Initial mobilization work force.

TABLE 1-5

WELL FIELD CONSTRUCTION WORK FORCE: PROPOSED ACTION

Drilling Superintendent	1
Drillers	8
Floor Workers	16
Derrick Workers	8
Miscellaneous Workers	8
Total	41

Notes:

1. Based on two drilling rigs working 24 hours.
2. Construction of 40 to 50 wells in 24 months.

TABLE 1-6

WELL FIELD PUMP STATION CONSTRUCTION WORK FORCE: PROPOSED ACTION

	1983				1984			
	1	2	3	4	1	2	3	4
Boilermaker	-	-	1	1	1	1	-	-
Electrician	-	2	4	4	3	3	3	2
Ironworker	-	1	1	1	1	1	1	1
Pipefitter	-	2	4	4	3	3	3	2
Teamster	-	-	1	1	1	1	1	-
Laborer	-	1	2	2	2	2	2	2
Millwright	-	-	1	1	1	1	1	1
Operator	-	-	1	1	1	1	1	1
Cement Mason	-	-	1	1	1	-	-	-
Painter	-	-	1	1	1	1	1	-
Brick Mason	-	-	-	1	1	-	-	-
Carpenter	-	-	1	1	1	1	1	-
Supervision	-	2	4	4	3	3	3	3
Total	-	8	22	23	20	18	17	12

Table 1-7 ASSUMED QUARTERLY CONSTRUCTION WORK FORCE FOR PREPARATION PLANTS: PROPOSED ACTION

Preparation Plant	Ultimate Capacity (MMTA)	1982		1983				1984				1985				1986				1987				1988				1989			
		3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
North Rawhide	5.0		5	19	29	43	63	72	80	68	38	5	9	20	14	7	20	18	8	2	5	11	8	-	-	-	-	-	-	-	-
Jacobs Ranch	22.4		24	95	131	176	224	260	278	200	114	11	24	50	31	60	69	52	35	35	31	29	20	15	15	-	-	-	-	-	-
North Antelope	10.0		5	5	29	40	55	70	82	70	50	60	50	25	12	14	18	21	49	56	25	18	5	5	11	21	49	56	25	18	5
TOTAL	37.4		34[a]	129	189	259	342	402	440	338	202	76	83	95	57	81	107	91	92	93	61	58	33	20	26	21	49	56	25	18	5

[a] Initial mobilization force.

TABLE 1-8

PIPELINE SPREAD CONSTRUCTION RESPONSIBILITIES: PROPOSED ACTION

Pipeline Spread	Pipeline Segment	Miles	Pipeline O.D. (inches)	Workers Required: Typical Spread*	Workers Required: Add for Rough Terrain
I	Jacobs Ranch to milepost PMB-367	367	46	670	78
II	Milepost PMB-367 to Ponca City	333	46	670	78
	Ponca City to Oologah	78	46	670	78
III	Oologah to Pryor	29	46	670	78
	Pryor to Muskogee	34	40	610	78
	Muskogee to Atkins Junction	156	40	610	78
IV	Jacobs Ranch to N. Antelope (water)	16	12	260	-
	N. Antelope to Jacobs Ranch (slurry)	16	24	360	-
	Jacobs Ranch to N. Rawhide (water)	55	18	260	-
	N. Rawhide to Jacobs Ranch (slurry)	55	32	360	-
	Jacobs Ranch to well field (water)	68	26	260	-
V	Atkins Junction to White Bluff	80	36	550	65
	White Bluff to Alexandria Junction	238	32	550	65
	Atkins Junction to Independence	93	16	260	-
VI	Alexandria Junction to New Roads	76	26	390	-
	New Roads to Wilton	66	16	260	-
	Alexandria Junction to Boyce	24	10	260	-
	Alexandria Junction to Lake Charles	89	14	260	-

Note: Spread I will proceed from south to north; all other spreads will proceed from north to south. Spread IV will proceed as shown above.

*Numbers shown represent maximum number of workers per pipeline spread.

TABLE 1-9

TYPICAL CONSTRUCTION CREW FOR SPECIAL RIVER CROSSINGS*

Superintendent	1
Welders	4
Welder/Helpers	4
Sideboom Operators	2
Dozer Operator	1
Dragline Operators	2
Oilers	2
Laser Operators	6
Fitter	1
Runner/Driver/Office Helper	1
Mechanic	1
Total	25

*These crews are used to cross scenic and other major rivers that require a separate construction crew because of high water flow. Smaller rivers would be crossed by the normal pipeline construction crews.

TABLE 1-10

CONSTRUCTION WORK FORCE FOR SLURRY PUMP STATIONS: PROPOSED ACTION

Slurry Pump Stations	1983			1984			
	2	3	4	1	2	3	4
NR, NA	85	85	50				
PMBC-1, P-2, P-3		150	180	180	180	180	150
P-4,P-5,P-6,P-7	180	450	450	450	450	450	300
P-8			100	100	100	100	75
PMB-9			75	100	50		
P-10			50	100	100		
P-11,PMB(I)-1, PMB-12				250	300	300	250
PMB(I)-2				130	130	90	
PMB-13,PM-14, PM-15				300	400	300	
PM-16,PM(B)-1, PM-17,PM(NW)-1				130	130	130	70
PM-18,PM(NW-2), PM(NW)-3			70	130	130	130	100
Total	265	685	975	1870	1970	1680	945

The slurry pump station quarterly construction work force requirements listed above are based on a typical pump station construction crew as follows:

Boilermaker (1)
Carpenter (3)
Cement Mason (2)
Ironmaker (6)
Operating Engineer (4)
Electrician (22)

Pipefitter (21)
Teamster (3)
Painter (3)
Brick Mason (1)
Millwright (5)
Supervision (19)

Total typical pump station construction crew of 100 workers is based on 7 pumps per station for 12,250 installed horsepower. Smaller pump station construction crews were factored accordingly in the assumed quarterly construction work force listed above.

TABLE 1-11

CONSTRUCTION WORK FORCE FOR TYPICAL 5-MMTA DEWATERING PLANT: PROPOSED ACTION

	1983				1984			
	1	2	3	4	1	2	3	4
Boilermaker	-	1	3	5	5	1	-	-
Electrician	-	3	17	32	41	43	37	18
Ironworker	5	26	44	51	43	12	-	-
Pipefitter	-	2	13	22	29	31	27	13
Teamster	-	1	2	2	3	3	2	1
Laborer	1	7	13	18	20	20	16	7
Millwright	-	-	-	4	11	16	16	8
Operator	1	6	10	13	15	15	13	6
Cement Mason	-	-	-	1	1	1	-	-
Painter	-	1	2	2	1	1	1	1
Brick Mason	-	-	-	1	1	1	-	-
Carpenter	2	11	20	25	24	16	2	-
Supervision	1	9	18	29	32	27	19	8
Total	10	67	142	205	226	187	133	62

TABLE 1-12

SUMMARY OF OPERATING PERSONNEL: PROPOSED ACTION

Location	Admin. & Support	Supervision	Engrs. & Draftsmen	Techs. & Operators	Secs. & Clerks	Craftsmen & Laborers	Total
Headquarters	6	4	6	19	6	-	41
Subtotal							41
Western District (Jacobs Ranch)							
Administration	4	-	-	-	-	-	4
Water Supply	-	1	-	10	-	-	11
Prep. Plants	-	41	-	80	7	68	196
Pipelines	-	-	-	6	-	3	9
Maintenance Base	-	1	-	7	-	15	23
Subtotal	4	43	0	103	7	86	243
Central District (Pryor)							
Administration	3	-	-	-	-	-	3
Dewatering Plant	-	13	-	14	6	31	64
Pipeline	-	-	-	8	-	16	24
Maintenance Base	-	1	-	15	-	17	33
Subtotal	3	14	0	37	6	64	124
Eastern District (White Bluff)							
Administration	3	-	-	-	-	-	3
Dewatering Plants	-	22	-	25	10	53	110
Pipeline	-	-	-	12	-	6	18
Maintenance Base	-	4	-	7	-	36	47
Subtotal	3	26	0	44	10	95	178
Southern District (New Roads)							
Administration	3	-	-	-	-	-	3
Dewatering Plants	-	18	-	21	9	45	93
Pipeline	-	-	-	8	-	16	24
Maintenance Base	-	4	-	7	-	36	47
Subtotal	3	22	0	36	9	97	167
Total	19	109	6	239	38	342	753

TABLE 1-13

SUMMARY OF MAINTENANCE BASE PERSONNEL: PROPOSED ACTION

	Western District (Jacobs Ranch)	Central District (Pryor)	Eastern District (White Bluff)	Southern District (New Roads)
Supervisor	1	1	1	1
Shop Foreman			3	3
Repairmen/Welder			4	4
Machinist			4	4
Millwright			13	13
Senior Electrical Technician	1	1	1	1
Senior Instrumentation Technician	1	1	1	1
Senior Communications Technician	1	1	1	1
Communications Technician		3		
Computer Control Technician		3		
Electrical/Instrumentation Technician	3	4	3	3
Senior Mechanical Repairman	1	1	1	1
Repairman/Welder	4	4	4	4
Equipment Operator	1	2	1	1
Pipeliner	10	12	10	10
Total	23	33	47	47

1.G PROJECT COMPONENTS

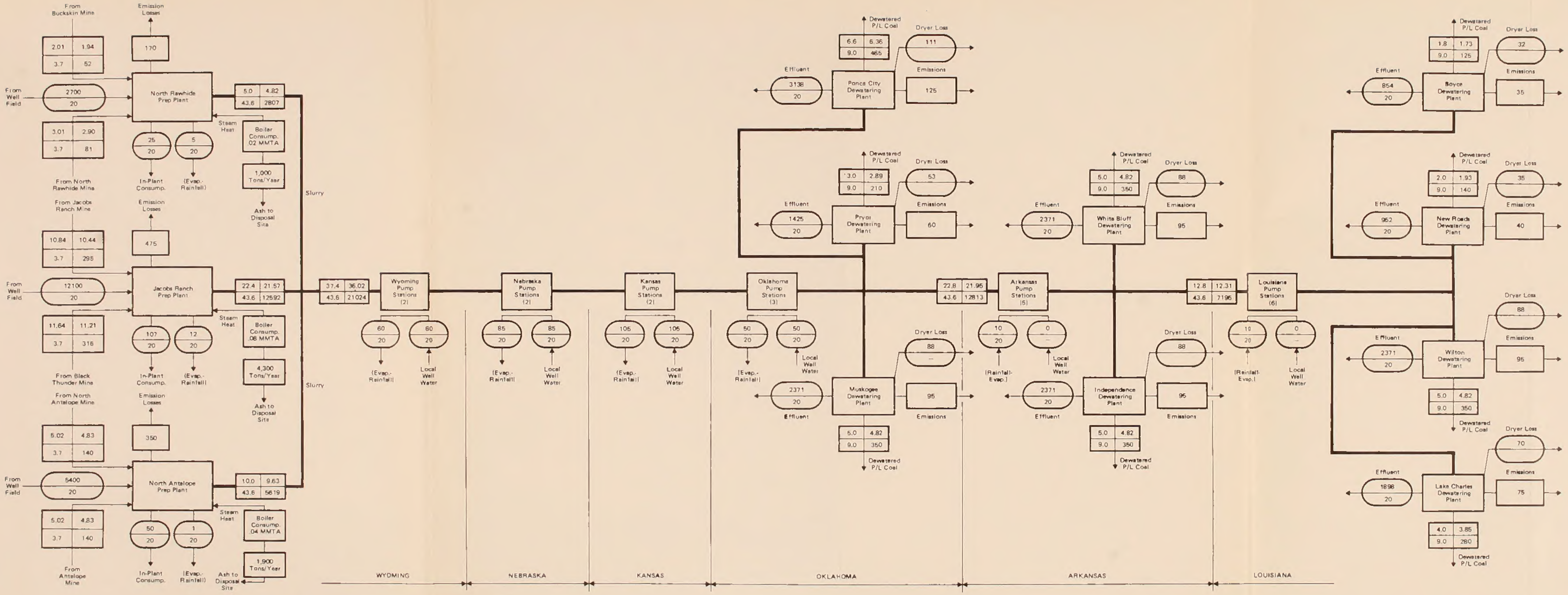
This section describes the construction and operation aspects of the proposed project that were determined to be necessary for impact assessment. Details concerning the construction and operation of the proposed project are described below for the coal slurry preparation plants, water supply system, coal slurry pipelines and pump stations, dewatering plants, and ancillary facilities. Figure 1-4 provides a system mass balance for the proposed action.

Materials needed to construct and operate the proposed project would be transported to distribution points near the project area by truck and rail. From these distribution points, the materials would be transported to the construction sites by truck or rail.

1.G.1 COAL SLURRY PREPARATION PLANTS

Three preparation plants would be located on private land adjacent to six coal mines in the Powder River Basin in northeastern Wyoming, as shown in Maps 1-2 through 1-4. A 22.4-MMTA facility would be installed at Jacobs Ranch, a 5.0-MMTA facility at North Rawhide, and a 10-MMTA facility at North Antelope. Figure 1-5 shows a flow diagram for the coal slurry preparation plants. The conceptual plot plan for the Jacobs Ranch preparation plant is shown in Figure 1-6 and for the North Rawhide and North Antelope plants in Figure 1-7. Figure 1-8 shows an elevation view of a typical coal slurry preparation plant.

Coal would be delivered by dump trucks or conveyors from the mine to a working stockpile with a 7-day capacity. Coal would be drawn from the stockpile and delivered by conveyor belt to the preparation plant. A 40-day reserve stockpile of coal would also be maintained for continuity of operation during any major disruption of coal supply. Belt scales and a sampling station would be installed to ascertain the quality and quantity of coal going to the preparation plant. Characteristics of typical as-mined coal are as follows:



NOTES:

1. Assume as-mined surface moisture ≈ 3.7%.
2. Assume slurry @ 56.4% surface dry solids, which corresponds to 41.7% bone dry solids.
3. Assume dewatered P/L coal @ 9% surface moisture.
4. Evaporation and precipitation values taken from water atlas of the U.S.
5. Water exported from Wyoming (21,024 ac-ft/yr) includes 20,000 ac-ft/yr from well field and 1,024 ac-ft/yr from surface moisture of as-mined coal.
6. Coal-water balance based on 37.4 MMTA throughput.

LEGEND

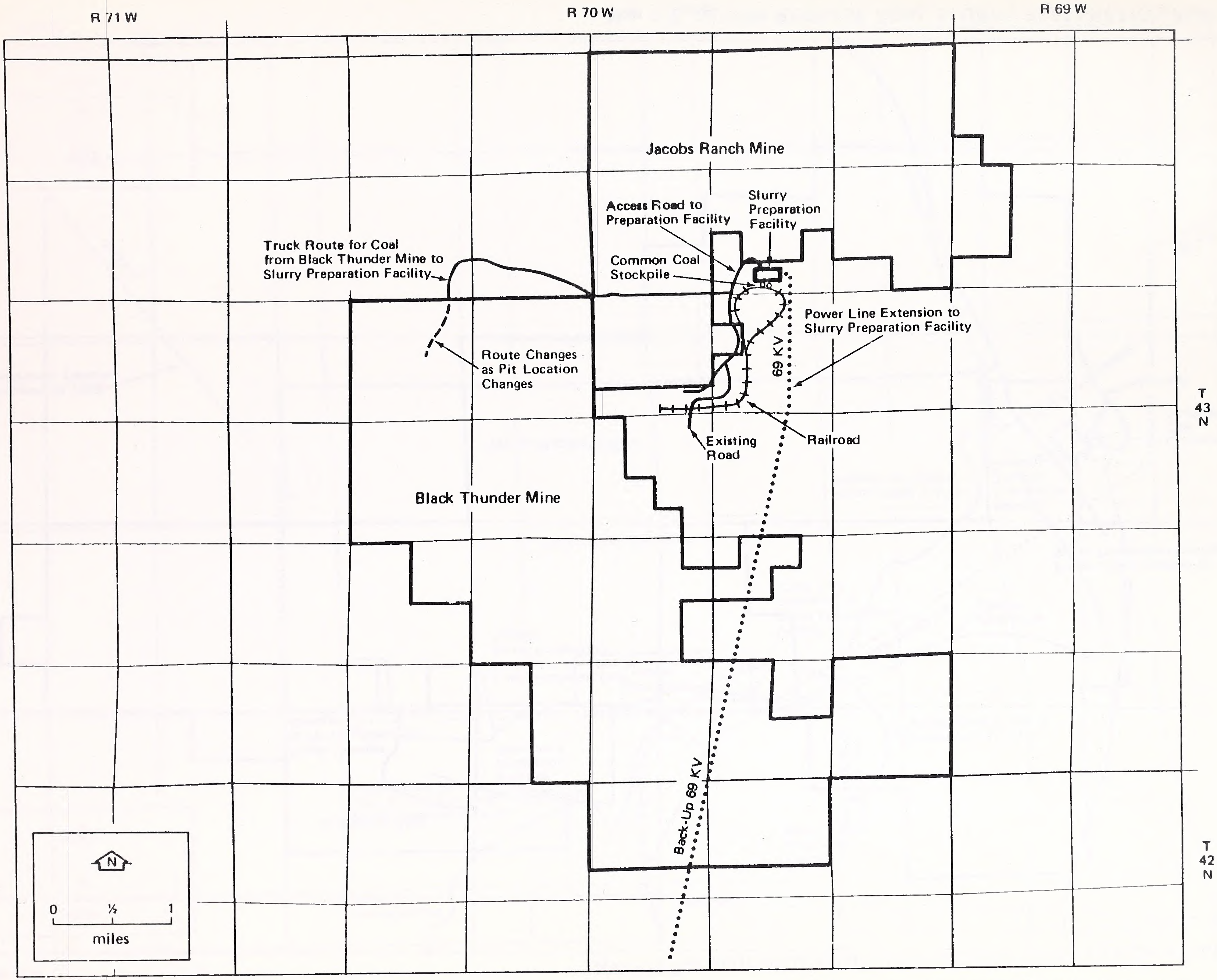
Coal:

As-mined Coal (MMTA)	Surface Dry Coal (MMTA)
Surface Moisture (%)	Surface Moisture (Acre-Ft/Yr)

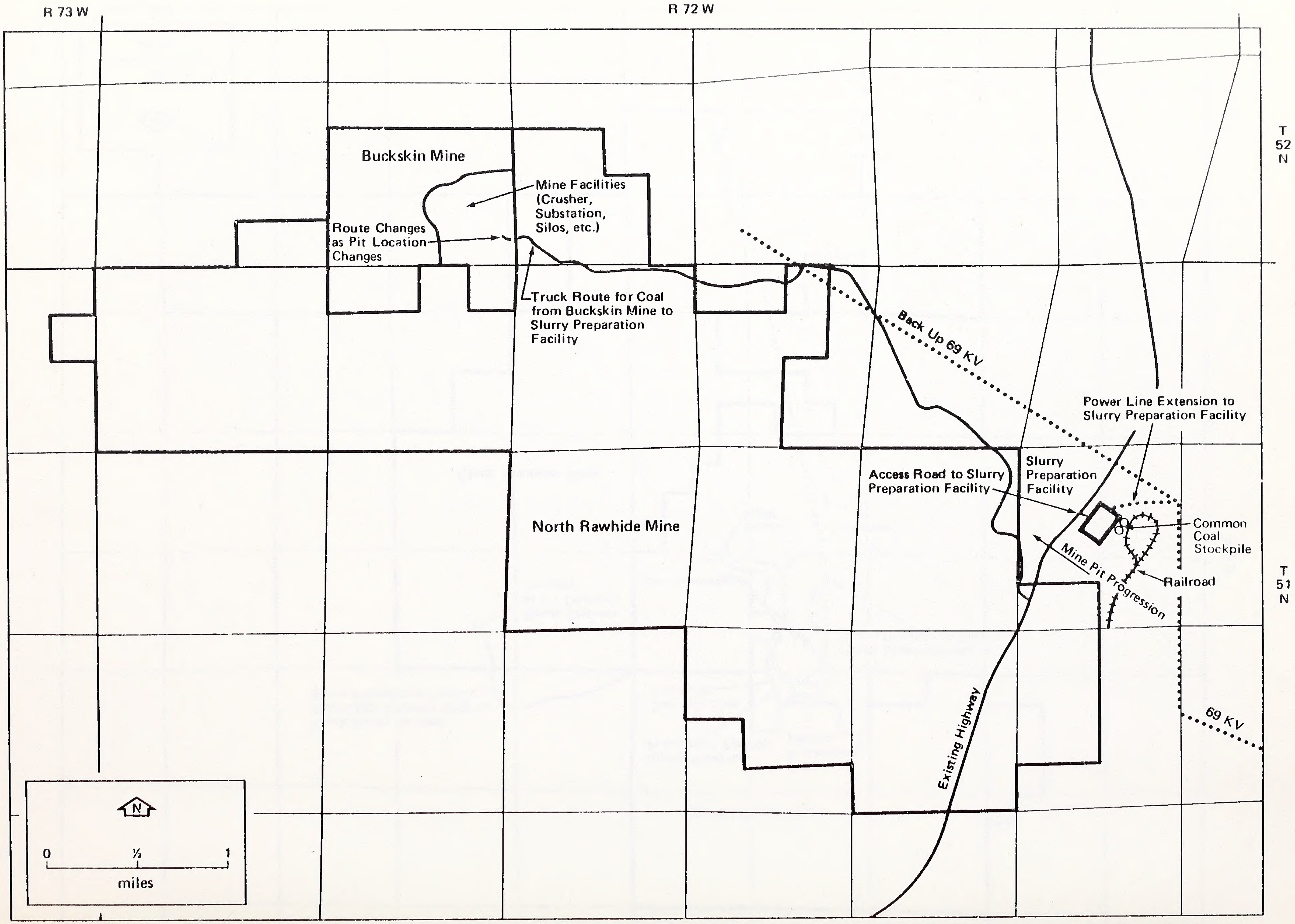
Water:
Water (Acre-Ft/Year)
TSS (ppm)

Emissions:
Total Emissions (Tons/Yr)

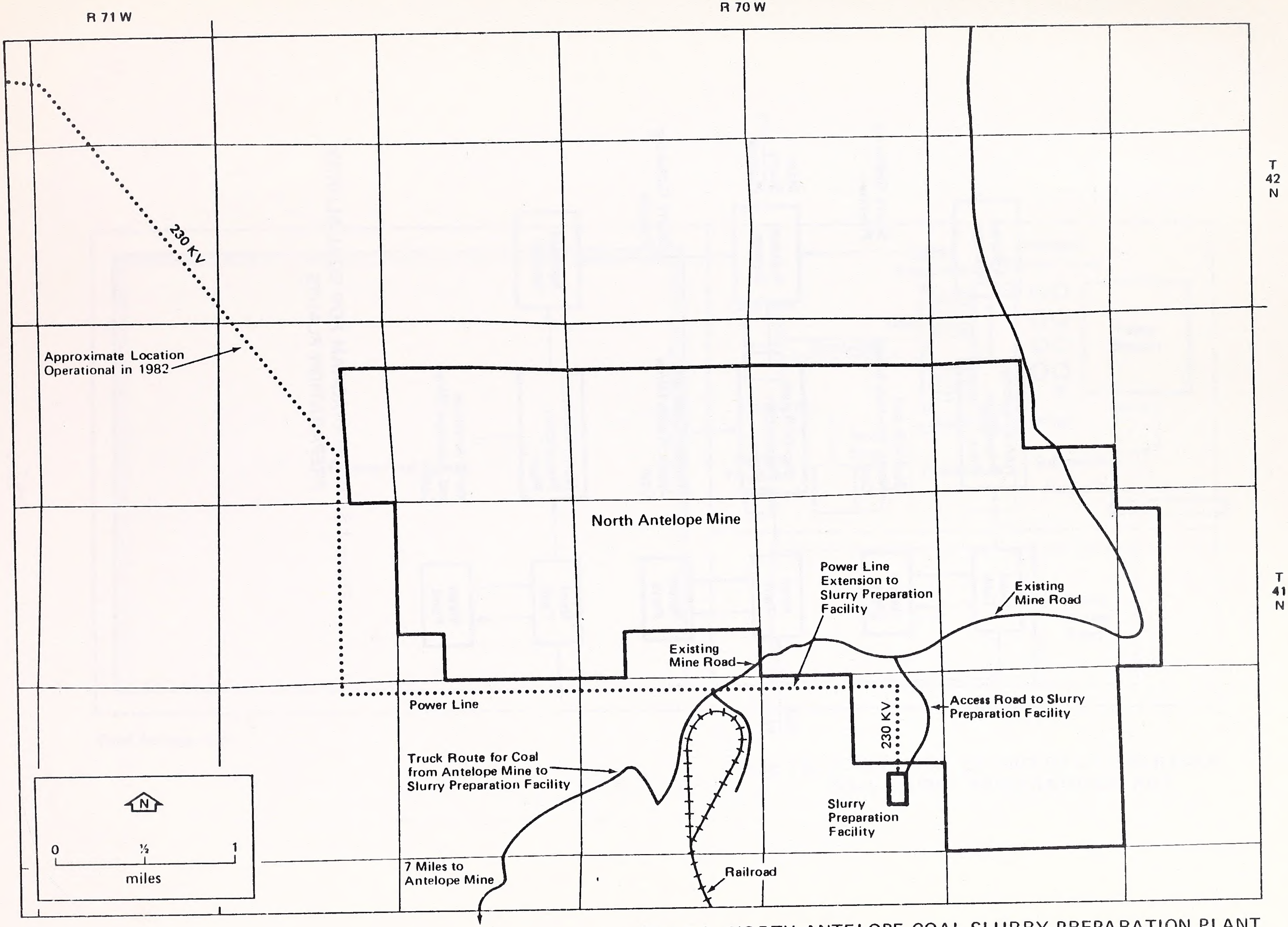
Figure 1-4. SYSTEM MASS BALANCE: PROPOSED ACTION


R 71 W
R 70 W
R 69 W
T 43 N
T 42 N
Jacobs Ranch Mine
Access Road to Preparation Facility
Slurry Preparation Facility
Truck Route for Coal from Black Thunder Mine to Slurry Preparation Facility
Common Coal Stockpile
Power Line Extension to Slurry Preparation Facility
69 KV
Route Changes as Pit Location Changes
Existing Road
Railroad
Black Thunder Mine
Back-Up 69 KV
N
0
½
1
miles

Map 1-2. JACOBS RANCH COAL SLURRY PREPARATION PLANT


R 73 W
R 72 W
T 52 N
T 51 N
Buckskin Mine
Mine Facilities (Crusher, Substation, Silos, etc.)
Route Changes as Pit Location Changes
Truck Route for Coal from Buckskin Mine to Slurry Preparation Facility
Back Up 69 KV
Power Line Extension to Slurry Preparation Facility
Access Road to Slurry Preparation Facility
Slurry Preparation Facility
Common Coal Stockpile
Railroad
Mine Pit Progression
North Rawhide Mine
Existing Highway
69 KV
N
0
½
1
miles

Map 1-3. NORTH RAWHIDE COAL SLURRY PREPARATION PLANT


R 71 W
R 70 W
T 42 N
T 41 N
230 KV
Approximate Location Operational in 1982
North Antelope Mine
Power Line Extension to Slurry Preparation Facility
Existing Mine Road
Existing Mine Road
Power Line
230 KV
Access Road to Slurry Preparation Facility
Truck Route for Coal from Antelope Mine to Slurry Preparation Facility
Slurry Preparation Facility
7 Miles to Antelope Mine
Railroad
N
0
½
1
miles

Map 1-4. NORTH ANTELOPE COAL SLURRY PREPARATION PLANT

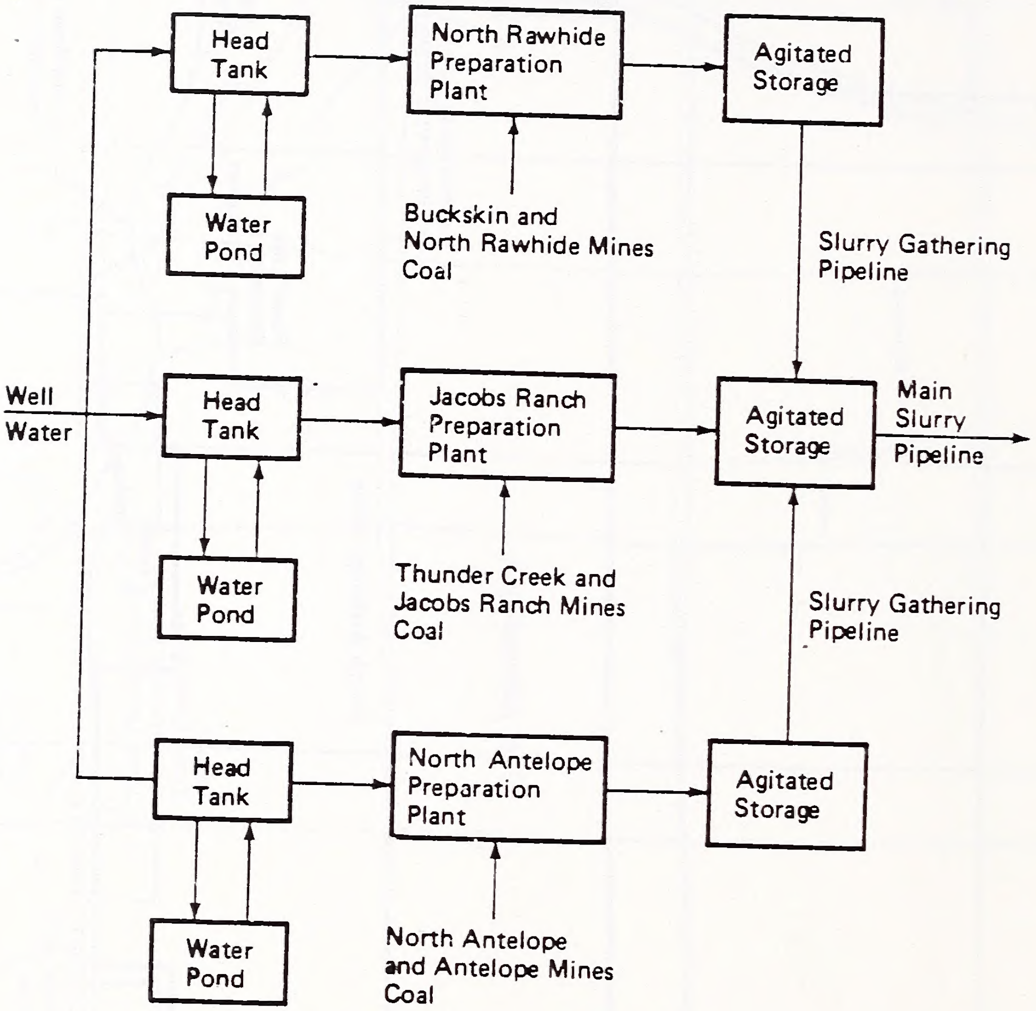
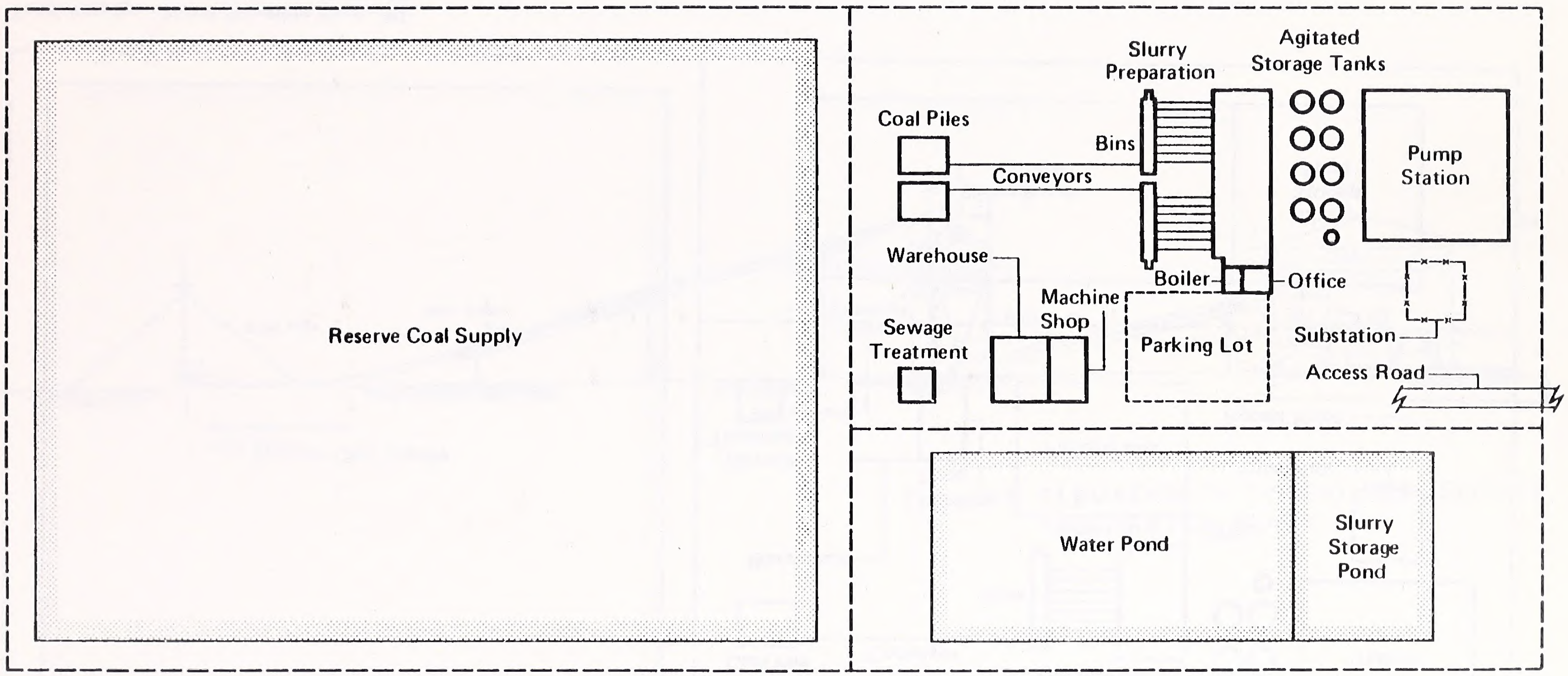
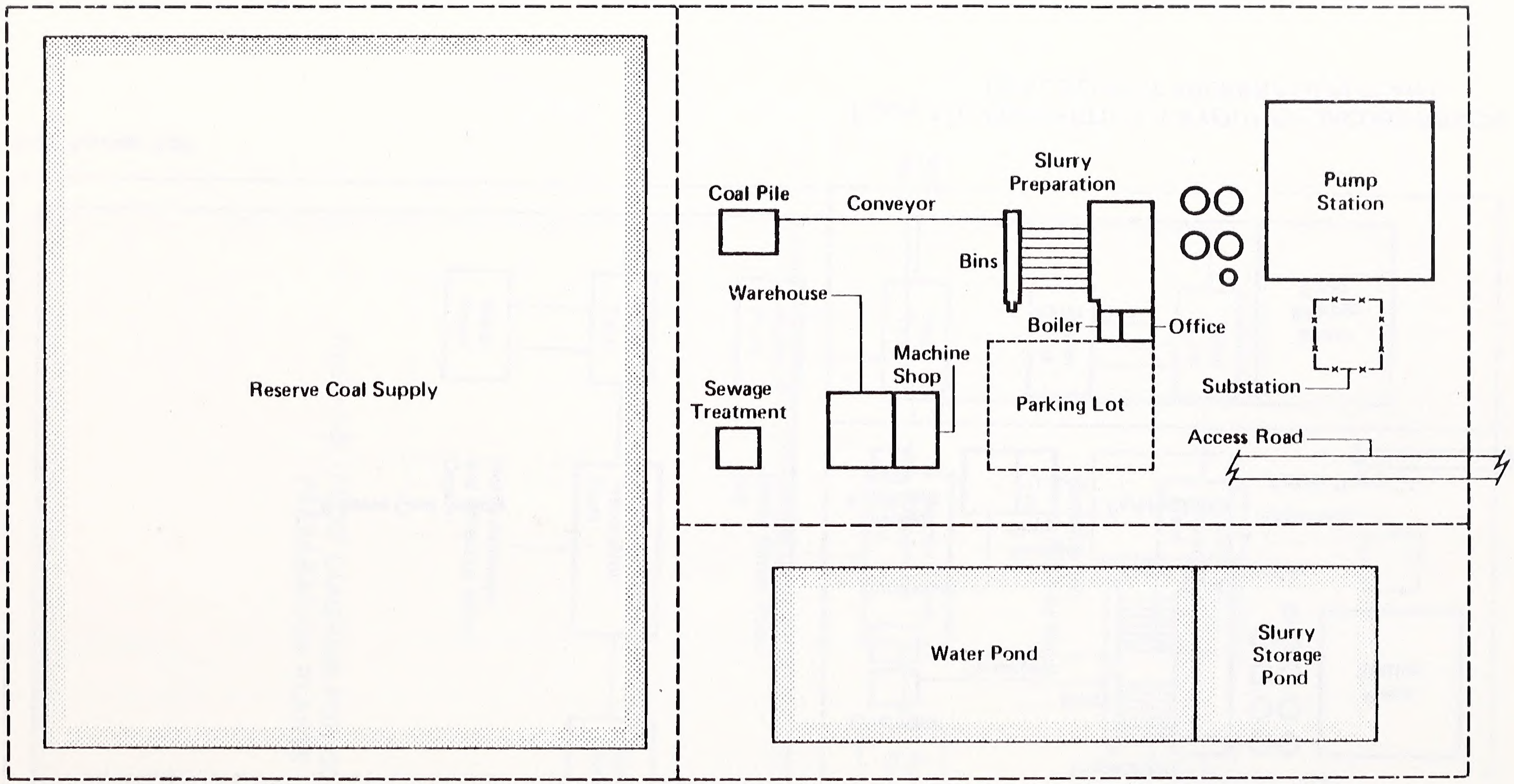

Head Tank
North Rawhide Preparation Plant
Agitated Storage
Water Pond
Buckskin and North Rawhide Mines Coal
Slurry Gathering Pipeline
Well Water
Head Tank
Jacobs Ranch Preparation Plant
Agitated Storage
Main Slurry Pipeline
Water Pond
Thunder Creek and Jacobs Ranch Mines Coal
Slurry Gathering Pipeline
Head Tank
North Antelope Preparation Plant
Agitated Storage
Water Pond
North Antelope and Antelope Mines Coal

Figure 1-5. FLOW DIAGRAM FOR COAL SLURRY PREPARATION PLANTS



Total Acreage—130

Figure 1-6. CONCEPTUAL LAYOUT OF JACOBS RANCH COAL SLURRY PREPARATION PLANT



Total Acreage: North Rawhide Plant–40
North Antelope Plant–65
Jacobs Ranch Plant–130

Figure 1-7. CONCEPTUAL LAYOUT OF COAL SLURRY PREPARATION PLANT

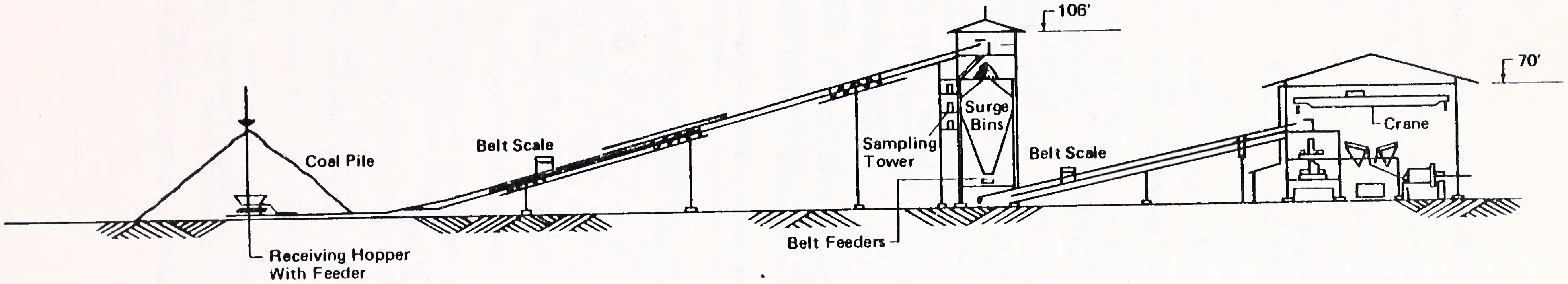


Figure 1-8. ELEVATION OF TYPICAL COAL SLURRY PREPARATION PLANT

Moisture content	26.10%
Specific gravity (bone-dry basis)	1.45
Heating value (at 9% surface moisture and 32.73% total moisture)	8150 Btu/lb
Ash content (bone-dry basis)	6.4%
Sulfur content (bone-dry basis)	0.53%

The coal would be crushed to pipeline size requirements by using two 75-inch-diameter cage crushers in series for each process line. The product from the crushers would be slurried and pumped to safety screens, which would make a 14-mesh separation to protect the pipeline from oversize material. In all cases, multiple process lines would be provided, depending on capacity and buildup schedule. Coal that did not go through the screen would be ground to size in a rod mill, with one mill being provided for each of three process lines. Slurry from the preparation plant would be pumped to the agitated storage tanks prior to entering the gathering lines and main pipeline. These agitated slurry storage tanks, provided at each plant, would give a storage volume equal to the amount designed to be produced in 8 hours of plant operation, thereby providing an adequate buffer between preparation plant and pipeline operations.

The coal slurry preparation plant would include dust collection facilities at all transfer points that are likely to be sources of airborne dust. The amount of particulate dust for a typical 5-MMTA plant is 230 tons per year; it is 330 tons per year for a 10-MMTA plant. These emission quantities are for airborne dust from the starting point of the coal-loading conveyor to the preparation plant and include all emission points inside the plant boundary, including a coal-fired boiler provided to supply heat to the building.

All the water used in the coal slurry preparation plant would be reused as slurry makeup water with the exception of coal pile runoff. Drainage facilities will be designed to channel runoff from the coal stockpile to a storm water retention basin. Water will be reclaimed from the retention basin and used for dust suppression, evaporation makeup, slurry makeup, or other suitable use.

Construction

Construction of the three coal slurry preparation plants would disturb an estimated 235 acres of land, as follows:

	Plant (acres)	Water and Slurry Storage (acres)	Coal Stockpile (acres)	Total (acres)
Jacobs Ranch	45	13	72	130
North Rawhide	20	4	16	40
North Antelope	30	3	32	65

Each site would be cleared, leveled, compacted, and graveled as necessary to support the permanent facilities. Whenever possible, existing topographic features and vegetation would be taken into consideration in selecting the locations of the buildings, roads, and other structures in order to minimize the amount of disturbed acreage and to blend the structures with the natural terrain. All exposed structures would be designed so that their configurations or forms and material types, textures, and colors would reduce their visibility. (See Section 1.D. for a more detailed discussion of construction procedures.)

Noise levels would temporarily increase near construction sites. Heavy equipment and construction activities typically produce noise levels of about 90 decibels at a distance of 50 feet (EPA 1974). Assuming a sound attenuation rate of 6 decibels per doubling distance (Bragdon 1971), these levels would decrease to about 55 decibels (about the level of normal conversation) within one-quarter mile.

The coal slurry preparation plants would be constructed in phases between 1983 and 1989 (Figure 1-3) as the pipeline throughput increases from 27.6 MMTA in 1985 to 37.4 MMTA after 1989. The work force requirements are shown on Tables 1-4 and 1-7.

Access for construction workers would be provided by existing public roads adjacent to the preparation plants.

Electric power for the preparation plants would be supplied by Tri-County Electrical Association via 69-kilovolt transmission lines located near each plant and would be well within the capacity of the utilities to supply additional power. Transmission lines connecting each plant with existing lines would be constructed within a 50-foot right-of-way. A substation would also be located at each plant. The wooden poles would be installed in holes dug by truck-mounted augers. The right-of-way would not be cleared of vegetation, except for an estimated 50 x 100 feet (0.1 acre) at some pole sites when necessary to provide suitable working space for equipment and assembly of the poles. Extensive clearing at the pole sites would be done only if trees or large shrubs were present. No new access roads would be constructed. The construction specifications would comply with the National Electric Safety Code. The power poles and conductors would be designed to conform to "Suggested Practices for Raptor Protection on Powerlines" (Miller et al. 1975) to avoid raptor electrocutions.

Operation and Maintenance

During project operation, the buildings, roads, and all other structures associated with the three coal slurry preparation plants would occupy about 235 acres.

A total of 196 people would be required to operate the plants: 117 at Jacobs Ranch, 27 at North Rawhide, and 52 at North Antelope.

Electric power for operation of the three plants would be supplied by the utility serving each mine site and would be well within the capacity of electric utilities to supply additional power. Transmission lines would be necessary to supply power to the plants.

Operation of the coal slurry preparation plants would require an estimated 200 acre-feet of water per year for uses not connected with slurry makeup (as discussed in Section 1.B.). This water would be used for evaporation makeup in storage ponds, sanitary water, dust suppression, plant washdown, and other uses not connected with slurry makeup water. Some of the water used in the preparation plants could be reused as slurry makeup water, which would reduce the total amount needed from the well field.

Existing noise levels at the coal slurry preparation plants are expected to reflect their rural locations. Most rural locations have a background noise level of about 35 to 40 decibels (day-night equivalent sound level scale) or about equal to the noise level in a California tomato field (EPA 1974). The plants would be located in the vicinity of existing coal mines. Ongoing mining activities, such as vehicle traffic and blasting, would be expected to have an intermittent effect on noise levels at the plants.

At project termination, all surface facilities associated with the coal preparation plants would be removed. The disturbed acreage would then be reclaimed, including reseeding when required by the landowner or surface management agency. (See Erosion Control and Revegetation in Section 1.D.4.)

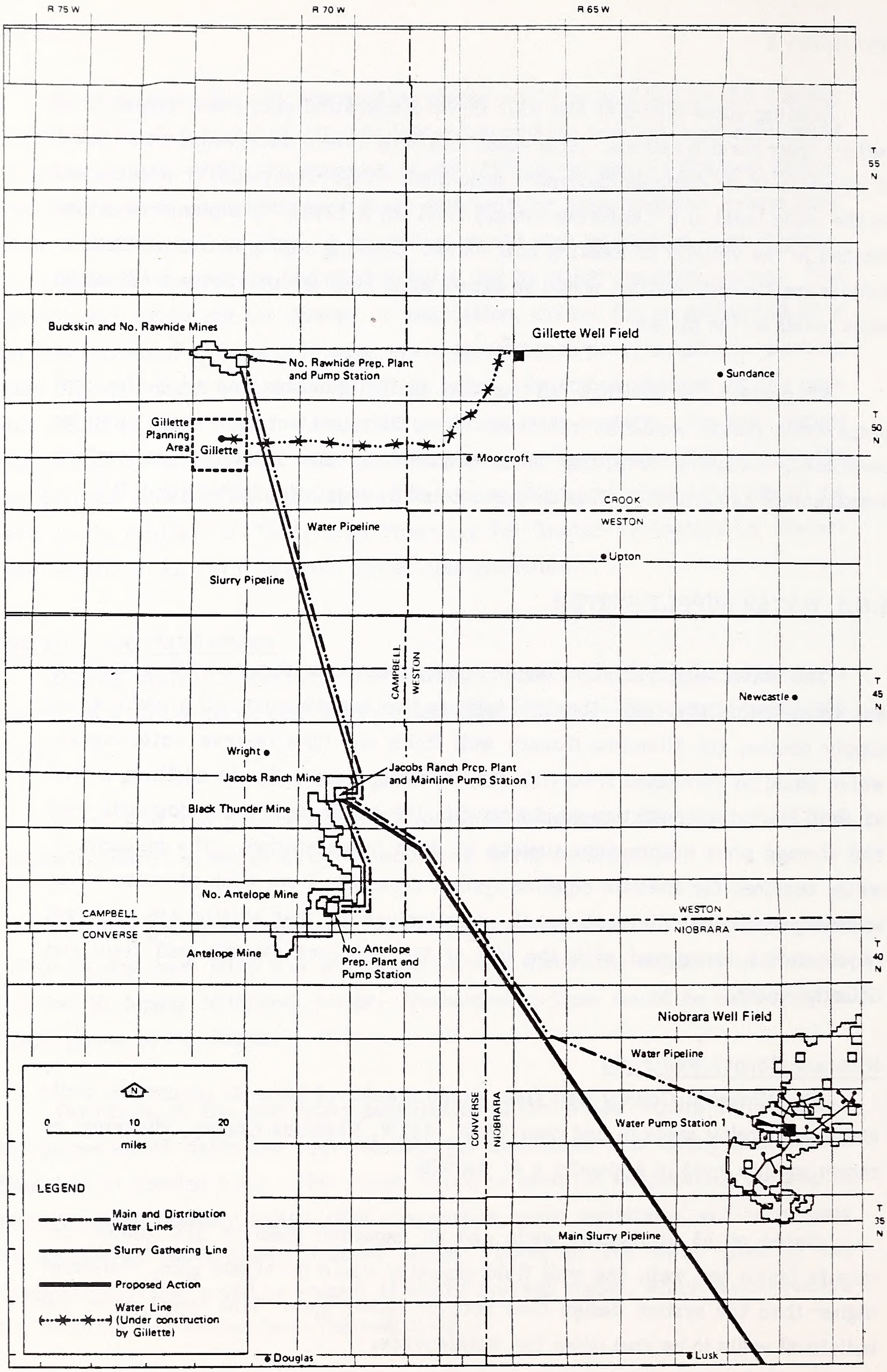
1.G.2 WATER SUPPLY SYSTEM

The water supply system would supply the water required for processing and transporting the coal. It would include two components: (1) a main water supply source, the Niobrara County well field; and (2) a reserve water supply, which could be purchased from Gillette, Wyoming (Map 1-5). In addition, a well at each slurry pump station would provide the water needed for domestic uses and storage pond evaporation makeup at each pump station. The amounts of water required for specific pipeline system processes from each of these water sources are discussed in Section 1.B. Also included in that section are the legal requirements associated with the use of the Niobrara County well field and Gillette water.

Niobrara County Well Field

The Niobrara County well field would consist of 40 to 45 production wells and 5 monitoring wells in and near T37N, R61W, Niobrara County, Wyoming, as shown on Map A-53 in Appendix A of the EIS.

Based on 45 production wells and an expected yield of 315 gallons per minute (gpm) per well, the well field capacity would be 14,000 gpm, somewhat higher than the system design flow rate of 12,300 gpm. This would allow for individual wells to be shut down for maintenance.



Map 1-5. PROPOSED ACTION WATER SUPPLY SYSTEM

Water would be raised from wells deeper than 2500 feet by multistage, submersible pumps. The pumps would provide hydraulic lift from an average depth of 1700 feet, with additional head to move the water through the gathering system to the surge tank. Pumps of 190 to 210 horsepower would be required, depending on the distance from the well to the surge tank.

A monitoring well system would be constructed and operated for one year prior to production of water from the well field and over the life of the project during the production phase. These observation wells would be located as follows:

- Section 28, T36N, R62W
- Section 16, T39N, R64W
- Section 16, T42N, R61W
- Section 4, T38N, R61W (This well was drilled in 1978, but the monitoring equipment has not been installed yet).
- Section 8, T38N, R60W

Monthly reports would be provided to the Wyoming State Engineer for a period of five years following the date of initial productions, showing the drawdown on the well levels, if any, in these five monitoring wells. One of the monitoring wells was drilled in 1978, but the monitoring equipment has not been installed yet.

The water gathering system, as shown on Map A-53 in Appendix A of the EIS, has been designed so that each well would feed into one of three major branches of pipe. All field piping for the gathering system would be installed below ground. The pipe would be carbon steel, externally coated with coal tar enamel wrap. Depending on water quality, the pipe may be lined with an internal epoxy or plastic lining for corrosion control.

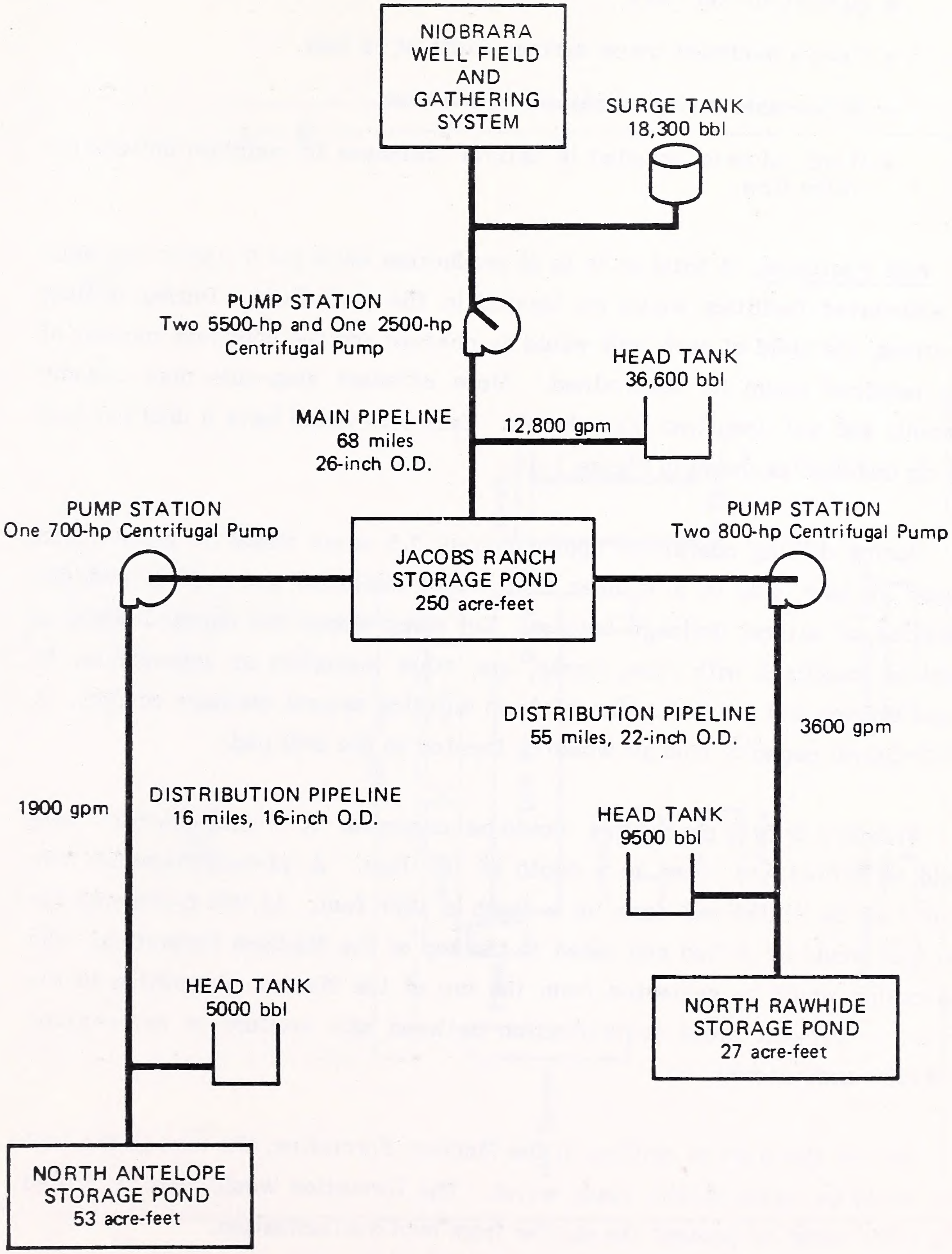
The water would be delivered to a well-field pump station where one 2500-horsepower and two 5500-horsepower centrifugal pumps would allow varying flow rates. A 18,300-barrel surge tank would be provided for the systems at the well field. Water would be transported through approximately 68 miles of buried steel pipeline to a 36,600-bbl. capacity distribution head tank at Jacobs Ranch. The tank would supply the preparation plant and storage pond at Jacobs Ranch and water pipelines to the North Antelope and North Rawhide preparation plants. The water supply line to the North Antelope plant would consist of approximately 16 miles of buried steel pipe, and the water supply line to North Rawhide would be approximately 55 miles long. The pipeline distribution system is shown on Map 1-5. The North Antelope site would be provided with a 5000-barrel head tank, and North Rawhide would have a 9500-barrel head tank to supply the preparation plants and storage ponds.

A flow sheet for the water supply system is shown in Figure 1-9. Access roads to each facility would be provided adjacent to the pipeline gathering system shown on Map A-53 in Appendix A of the EIS.

Electric power to the well facilities would be provided by a transmission line network that would follow the routes of the access roads.

Construction. Construction of the water supply system would begin during 1983 and be completed in late 1984 (Figure 1-2). It would require a work force of about 41 for the Niobrara well field, and would range from about 60 to a peak of 260 for the rest of the water supply system (refer to Table 1-4). Construction procedures relevant to the assessment of environmental impacts of the water supply system are described below for access roads, well facilities, water gathering lines, pump station, main water pipeline, and distribution lines and storage ponds.

Access Roads. Approximately 62 miles of new roads would be used to provide access to the 40 to 50 water wells and other facilities in the well field. All access roads would be located on private land and would be constructed or upgraded to:



Note: One acre-foot = approximately 7758 bbl.

Figure 1-9. FLOW SHEET FOR WATER SUPPLY SYSTEM

- Support 40-ton loads
- Have a minimum travel surface width of 12 feet
- Be passable during all seasons of the year
- Have culverts installed in natural drainages to maintain anticipated water flow

Well Facilities. A total of 40 to 45 production wells and 5 monitoring wells and associated facilities would be located in the well field. During drilling operations, the yield of each well would be checked and the maximum number of wells required would be determined. More efficient step-outs may become apparent, and well locations may change. Each site would have a drill pad and drill rig installed as shown in Figure 1-10.

During drilling operations approximately 2.5 acres would be cleared and leveled at each site in a manner that would minimize cut-and-fill and the alteration of natural drainage courses. On steep slopes the exposed surfaces would be stabilized with rock, riprap, and other materials as appropriate, to reduce erosion and prevent sediment from entering natural drainage courses. A 40,000-barrel-capacity mud pit would be located on the drill pad.

Standard drilling procedures would be employed. A 17-inch-diameter hole would be drilled and cased to a depth of 100 feet. A 12-inch-diameter hole would then be drilled and cased to a depth of 1800 feet. At this depth an 8.75-inch hole would be drilled and cased to the top of the Madison Formation. The hole casing would be cemented from the top of the Madison Formation to the surface to prevent cross contamination between any aquifers or hydrocarbon reservoirs encountered.

Before the start of drilling in the Madison Formation, the mud in the well hole would be replaced with clear water. The formation would thus be drilled with clear water to protect the aquifer from mud contamination.

The drilling operations would use approximately 112 acre-feet of water; the drilling fluid would consist of bentonite, gel, and minor amounts of

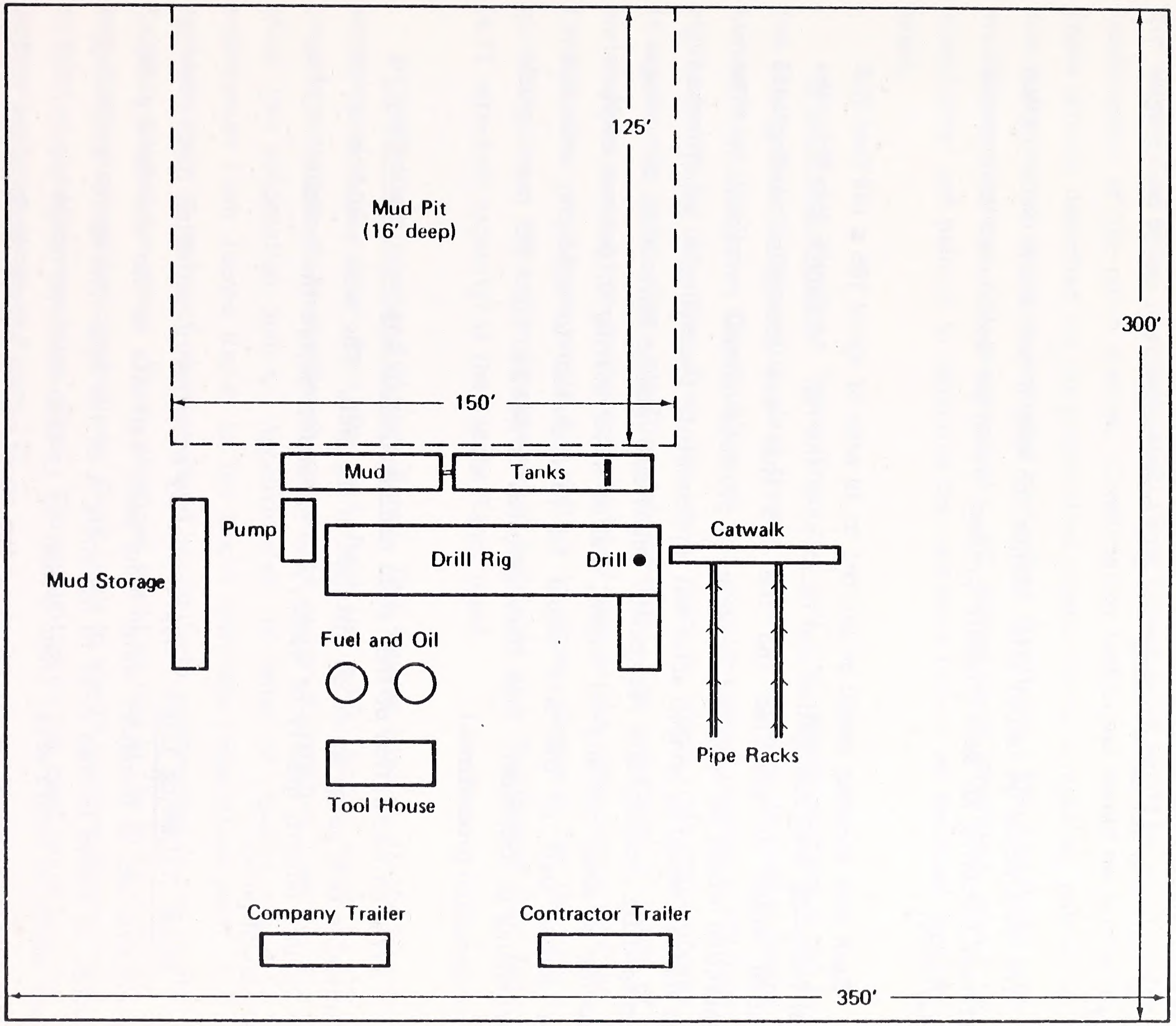


Figure 1-10. WELL FACILITY DRILLING CONFIGURATION

chemicals. This low-solids-content mud would weigh approximately 9.5 pounds per gallon. The drilling fluids would be discharged into the mud pit and left to evaporate. After well completion, the residue in the pit would be covered with fill that had been set aside during well-pad construction and would be revegetated.

The well would be tested after completion and, if necessary, a stimulation treatment involving an acid-fracture process would be undertaken to increase productivity.

Each well location would be limited to an area of about 105 x 150 feet (0.5 acre) following well completion and removal of the rig. To accomplish this, the location would be scarified and the soil that was stockpiled during site preparation would be replaced in order to promote natural revegetation. The land surface would be leveled after soil replacement. Depending on conditions at each specific location, site restoration might also include contouring, terracing, reducing of steep cut-and-fill slopes, and/or water-barring to prevent erosion. The unused part of the site would be revegetated to conform with the surrounding environment. (See "Revegetation" in Section 1.D.4 for more details on reclamation procedures.)

After an estimation of the yield had been established and the drilling rig removed, a test pump would be installed in the well. The well would be tested for volume output, quality of water, and drawdown before the installation of a permanent pump.

Water Gathering Lines. Approximately 62 miles of gathering lines would be constructed to transport water from each well site to the well-field pump station, as shown in Map A-53 in Appendix A of the EIS. The buried gathering lines would be constructed from 6-inch to 16-inch-diameter steel pipe. The gathering lines would be placed along the edges of the access roads in the well field so that minimum additional acreage would be required for construction. The gathering line trenches would be excavated to a depth that would permit at least 3 feet of cover. The surface would be allowed to revegetate following backfilling of the trench and leveling.

Pump Station. One pump station would be located in the well field at the origin of the main water supply pipeline. This pump station would contain one 2500-horsepower and two 5500-horsepower electric centrifugal pumps to allow for varying flow rates. Approximately three fenced acres would be required for construction of the pump station. Construction techniques would be similar to those already described for the preparation plants. Once completed, only about one-quarter acre would be occupied by surface structures. The remaining area would be reclaimed and revegetated. All aboveground structures would be constructed and painted to minimize the aesthetic impact on the local environment.

Main Water Pipeline. Water from the well field would be transported to the Jacobs Ranch preparation plant through about 68 miles of 26-inch-diameter buried steel pipeline. Construction of this pipeline would require a 100-foot right-of-way for 31 miles from the well field to where this right-of-way intersects the main slurry pipeline right-of-way. The remaining 37 miles of water pipeline would be in the same right-of-way as the main slurry pipeline. Construction procedures would be similar to those discussed for the slurry gathering lines. The water pipeline would terminate at a distribution head tank (4.72 acre-feet capacity) at the Jacobs Ranch plant.

Distribution Lines and Storage Ponds. The storage pond at Jacobs Ranch would receive all water from the well field and would supply water to the preparation plant at Jacobs Ranch and to the water distribution lines for the other two preparation plants. Approximately 16 miles of pipeline would be constructed from Jacobs Ranch to the North Antelope preparation plant, and approximately 55 miles of pipeline would be similarly constructed to the North Rawhide preparation plant. These pipelines would be laid in the same right-of-way as the slurry gathering pipelines. Head tanks to absorb pipeline surges would be located at each preparation plant. The capacities of the head tanks and the storage ponds are shown in Figure 1-9.

Operation and Maintenance

During project operation the well-field facilities and associated water supply system would occupy about 216 acres of land, as shown in Table 1-14.

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TABLE 1-14

ACREAGE REQUIREMENTS FOR WATER SUPPLY SYSTEM: PROPOSED ACTION

	Acreage	
	Construction	Operation
Well Facilities	125	25
Access Roads[a]	376	188
Pump Station (N-1)	3	3
Main Water Pipeline[b]	376	0
Total	880[c]	216[c]

Note: All numbers are rounded to nearest whole number.

[a] Assumes 50-foot-wide right-of-way for construction and 25-foot-wide right-of-way for operation. Gathering pipelines included.

[b] Assumes 100-foot-wide right-of-way for construction. Acreages calculated only for the 31 miles not in common with main slurry pipelines (refer to strip maps in Appendix A of the EIS).

[c] Head tanks, storage ponds, and the water distribution pipeline pump stations (N-2, and N-3) are part of coal slurry preparation plant acreage. The water distribution pipelines (Jacobs Ranch to North Rawhide and North Antelope) are within the coal slurry gathering pipelines rights-of-way, and thus were not included in this table.

Land disturbed during construction but not used during operation would be reclaimed as required by landowners or the appropriate surface management agency.

Approximately 11 people would be required to operate the water supply system. This staff would operate and control the pump station and well facilities to provide the required water for the preparation plants. In addition, they would record the Madison Formation drawdown at the five monitoring wells every month.

Transmission lines would be required to supply the power to the pumps.

Noise levels would not be expected to increase, since the pumps at the well facility would be the deep-well, submersible type.

Pipeline maintenance practices would be the same as those discussed for the slurry pipeline system. In addition, each well would be tested every six months for output and electromechanical condition.

At project termination, all surface facilities would be removed and the disturbed acreage reclaimed.

Gillette Reserve Water Supply

ETSI also plans to obtain water from the city of Gillette, Wyoming. The city of Gillette is presently developing a well field near Moorcroft, approximately 42 miles northeast of Gillette. The well field will consist of 10 to 14 wells drilled into the Madison Formation. The design capacity of this system is 11,200 acre-feet per year. The system will be underutilized most of the time, since this capacity is based on the peak-day demand for the projected population growth. It is therefore proposed to use the surplus water as a reserve supply to the ETSI system. As discussed in Section 1.B., ETSI and the city of Gillette have signed a memorandum of understanding for the use of this water.

A pump station would be constructed at the point where the Gillette pipeline would intersect the ETSI Jacobs Ranch-North Rawhide water supply line approximately 7 miles south of the proposed North Rawhide preparation plant. This pump station would use the existing ETSI water line for pumping surplus Gillette water in either direction, to North Rawhide or Jacobs Ranch, and would be considered part of the ETSI system. Two 600-horsepower centrifugal pumps and two 1000-horsepower multistage centrifugal pumps would be installed to allow for varying flow rates and delivery to Jacobs Ranch and/or North Rawhide.

1.G.3 COAL SLURRY PIPELINES AND PUMP STATIONS

The coal slurry pipelines and pump stations would consist of two buried slurry gathering lines, a buried main slurry pipeline, and 23 slurry pump stations (see strip maps in Appendix A of the EIS). Slurry from the North Rawhide and North Antelope preparation plants would be transported via 55-mile, 32-inch-diameter and 16-mile, 24-inch-diameter pipelines, respectively, to the origin of the main slurry pipeline at the Jacobs Ranch preparation plant. The main slurry pipeline would extend approximately 1664 miles from the Jacobs Ranch preparation plant to the proposed delivery terminals in Oklahoma, Arkansas, and Louisiana. Pipeline distances from the mine site to each of the proposed delivery terminals are shown in Table 1-1.

Data on pipeline diameters and lengths and the locations of pump stations are shown in Tables 1-8 and 1-15. The change in pipe diameter from section to section reflects the projected reduced throughput as slurry is delivered to intermediate customers.

The coal delivery schedule given in Table 1-1 indicates the buildup in delivery requirements. The capacities of the coal slurry preparation plants are based on this schedule for the development of construction and manpower schedules. Each pipeline section would be designed to handle the ultimate system requirements and would be built up to full capacity according to the construction schedule.

Pump stations located within the North Rawhide and North Antelope preparation plant sites (NR and NA) would pump slurry through the gathering

TABLE 1-15
COAL SLURRY PIPELINE PUMP STATIONS: PROPOSED ACTION

State	County/Parish	Pipeline Segment	Milepost	Station Location	Pump Station Designation
Wyoming	Campbell	N. Rawhide to Jacobs Ranch	NR-0	North Rawhide	NR[a]
Wyoming	Campbell	N. Antelope to Jacobs Ranch	NA-0	North Antelope	NA[b]
Wyoming	Campbell	Jacobs Ranch to Ponca City	PMBC-0	Jacobs Ranch	PMBC-1[c]
Wyoming	Niobrara	Jacobs Ranch to Ponca City	PMB-46.1	-	P-2
Wyoming	Niobrara	Jacobs Ranch to Ponca City	PMB-91.9	-	P-3
Nebraska	Garden	Jacobs Ranch to Ponca City	PMB-231.1	-	P-4
Nebraska	Red Willow	Jacobs Ranch to Ponca City	PMB-373.9	-	P-5
Kansas	Decatur	Jacobs Ranch to Ponca City	P-408.5	-	P-6
Kansas	Stafford	Jacobs Ranch to Ponca City	P-560.6	-	P-7
Oklahoma	Noble	Ponca City to Pryor	P-700	Ponca City	P-8
Oklahoma	Mayes	Pryor to Muskogee	P-807.5	Pryor	PMB-9
Oklahoma	Muskogee	Muskogee to Atkins Junction	P-841.6	Muskogee	P-10
Arkansas	Crawford	Muskogee to Atkins Junction	P-911.6	-	P-11
Arkansas	Pope	Atkins Junction to Independence	PMB(I)-0	Atkins Junction	PMB(I)-1[d]
Arkansas	Pope	Atkins Junction to White Bluff	PMB-997.4	Atkins Junction	PMB-12[d]
Arkansas	Van Buren	Atkins Junction to Independence	PMB (I)-39.0	-	PMB(I)-2
Arkansas	Jefferson	White Bluff to Alex. Junction	PMB-1077.6	White Bluff	PMB-13
Arkansas	Bradley	White Bluff to Alex. Junction	PM-1137.6	-	PM-14
Louisiana	Ouachita	White Bluff to Alex. Junction	PM-1203.6	-	PM-15
Louisiana	La Salle	White Bluff Alex. Junction	PM-1257.6	-	PM-16
Louisiana	Rapides	Alex. Junction to Boyce	PM(B)-0	Alex. Junction	PM(B)-1[e]
Louisiana	Rapides	Alex. Junction to Lake Charles	PM-1315	Alex. Junction	PM-17[e]
Louisiana	Rapides	Alex. Junction to New Roads	PM(NW)-0	Alex. Junction	PM(NW)-1[e]
Louisiana	Allen	Alex. Junction to Lake Charles	PM-1360	-	PM-18
Louisiana	Pointe-Coupee	New Roads to Wilton	PM(NW)-75.6	New Roads	PM(NW)-2
Louisiana	Iberville	New Roads to Wilton	PM(NW)-108	-	PM(NW)-3

Milepost and pump station designations are explained in Appendix A of the EIS.

[a] Pump station NR is located within the boundaries of the North Rawhide preparation plant.

[b] Pump station NA is located within the boundaries of the North Antelope preparation plant.

[c] Pump station PMBC-1 is located within the boundaries of the Jacobs Ranch preparation plant.

[d] These two pump stations are located together at the same pump station location.

[e] These three pump stations are located together at the same pump station location.

lines to the agitated storage tanks at the Jacobs Ranch preparation plant. The first pump station (PMBC-1) on the main slurry pipeline route is located within the Jacobs Ranch preparation plant site. The remaining 20 slurry pump stations would be located along the main slurry pipeline route. A plot plan of a typical pump station is shown on Figure 1-11. Each pump station would house positive-displacement reciprocating pumps powered by electric motors. The location of each pump station is shown in Table 1-15.

Pump station P-2 would have a coal slurry recovery pond, provided in case that nonspecification coal slurry is put into the line due to operator error (Figure 1-12). The nonspecification slurry would be removed at pump station P-2 to prevent plugging of the line. The nonspecification coal would then be sold or recycled through the preparation plants or otherwise suitably disposed of.

Mainline valves would be installed at each pump station location. In addition, valves would be located on each side of major rivers where a line rupture would cause a significant slurry spill.

Pipeline route markers would be installed at road crossings, water crossings, property boundaries, and other pipeline crossings.

Aerial markers would be installed every few miles along the route and at all turning points.

The following sections provide information on the construction, operation, and abandonment of the slurry pipelines and pump station facilities.

Construction

Coal Slurry Pipelines. Construction of the proposed main slurry pipeline and slurry gathering lines would disturb approximately 21,028 maximum acres of land and would take place during 1983 and 1984 (Figure 1-2). A maximum work force of approximately 3100 would be required (Table 1-4).

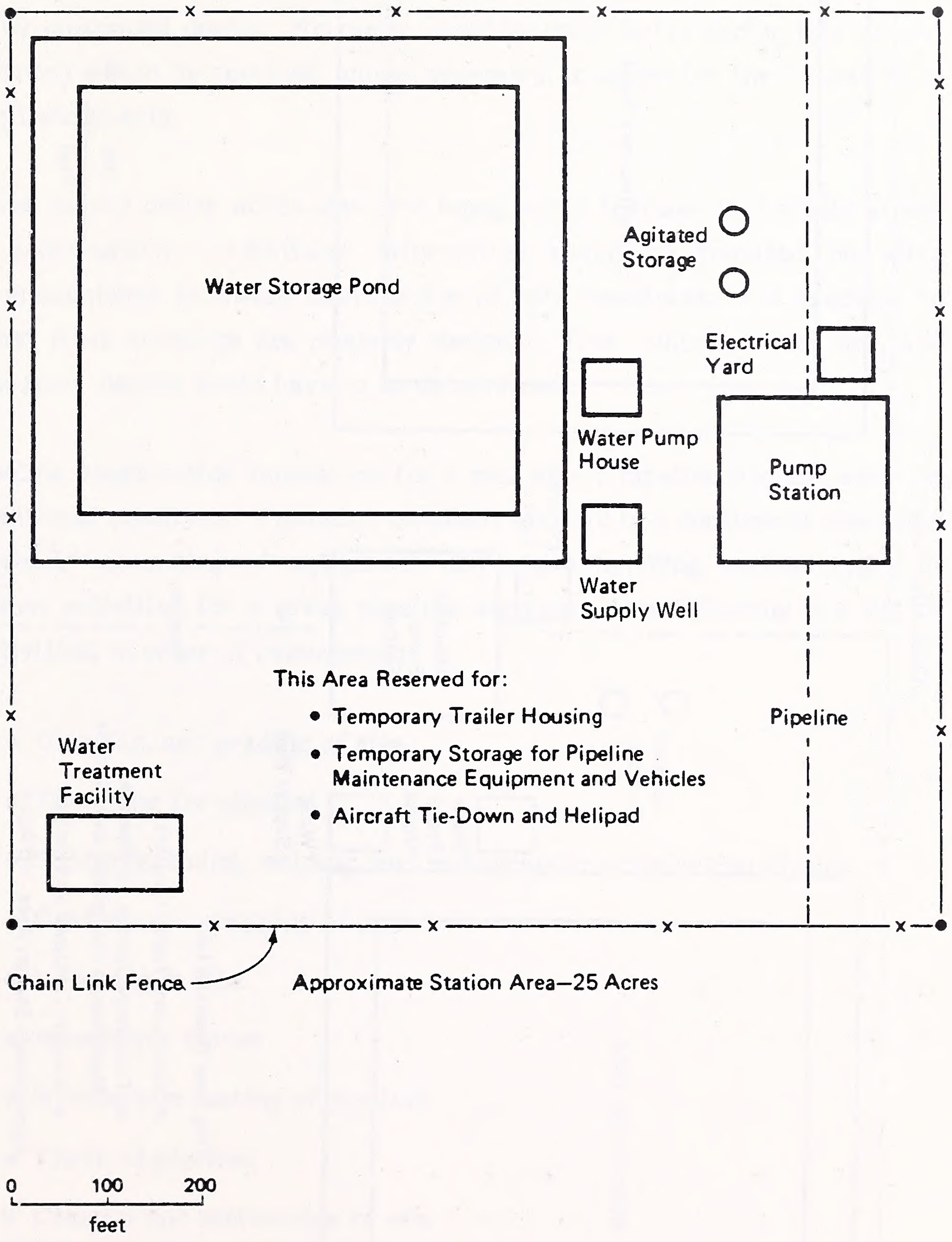


Figure 1-11. LAYOUT OF TYPICAL MAIN-LINE PUMP STATION

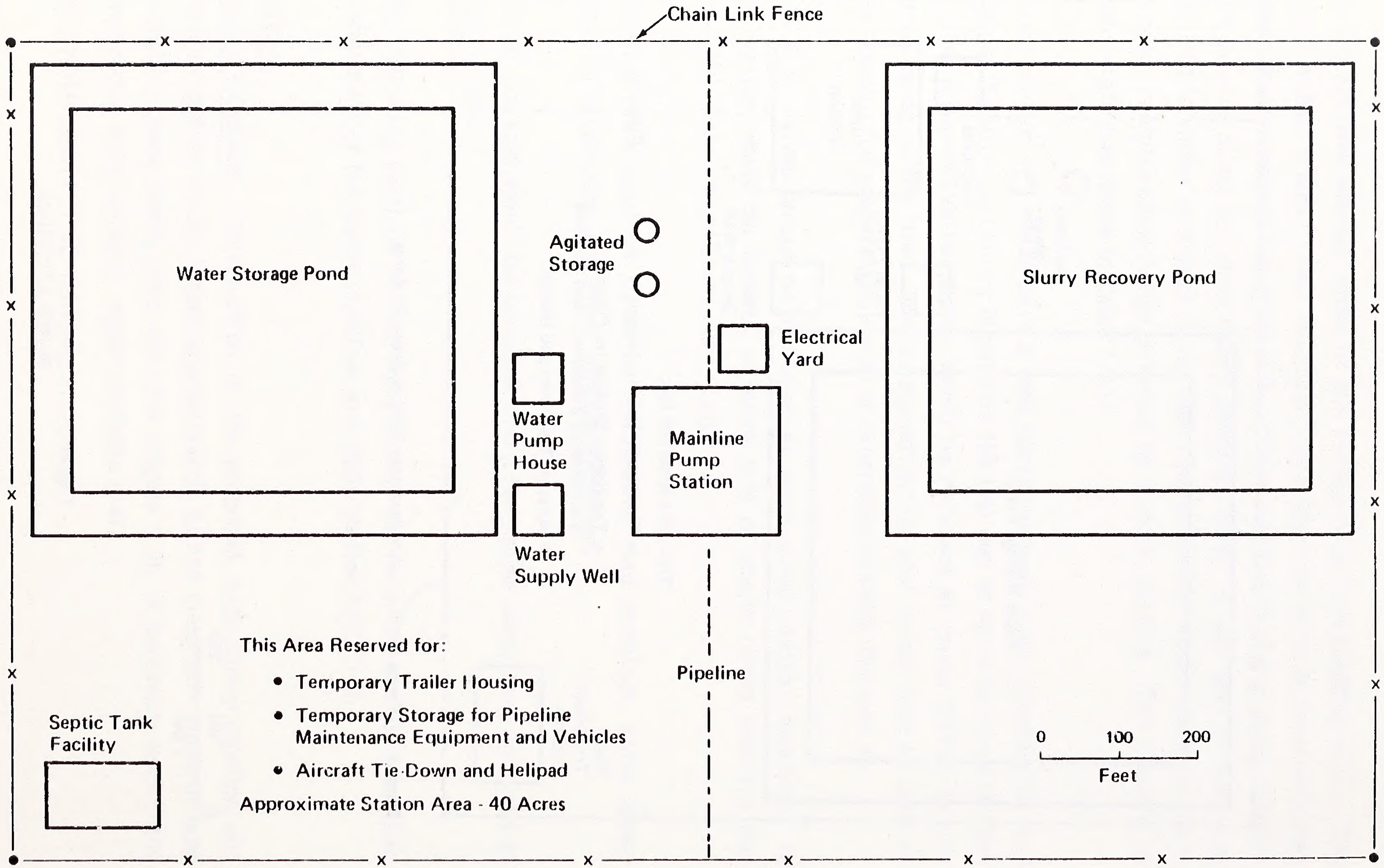


Figure 1-12. PLOT PLAN OF PUMP STATION P-2

The proposed final route design would be determined after a field survey of the centerline of the alignment. Existing roads would be used as much as possible by on-ground crews. No roads would be constructed during this survey. No vegetation would be removed unless necessary to allow for the operation of surveying instruments.

These survey crews would also plot topographic features that would affect pipeline construction. Additional information would be required on some features encountered to ensure construction of safe structures. For example, to ensure that river crossings are properly designed, flow volume, water use, and maximum scour depths would have to be determined.

Pipeline construction techniques for a coal slurry pipeline are the same as for conventional pipelines. Typically, pipelines are laid in a continuous operation by a "spread," consisting of equipment and crews handling various types of construction activities for a given pipeline segment. The following is a list of major activities, in order of occurrence:

- Clearing, and grading of site
- Trenching for pipeline
- Stringing, lining, welding, and radiographic examination of pipe
- Coating and wrapping of pipe
- Lowering in pipe
- Backfilling trench
- Hydrostatic testing of pipeline
- Tie-in of pipeline
- Cleanup and restoration of site

Each of these operations is described in detail later in this section. Figures 1-13 and 1-14 show components of a typical spread. Table 1-16 lists major pieces of equipment normally used on a main pipeline spread. Construction of the pipeline would be accomplished by six crews working concurrently on the various portions of the project (Figure 1-2).

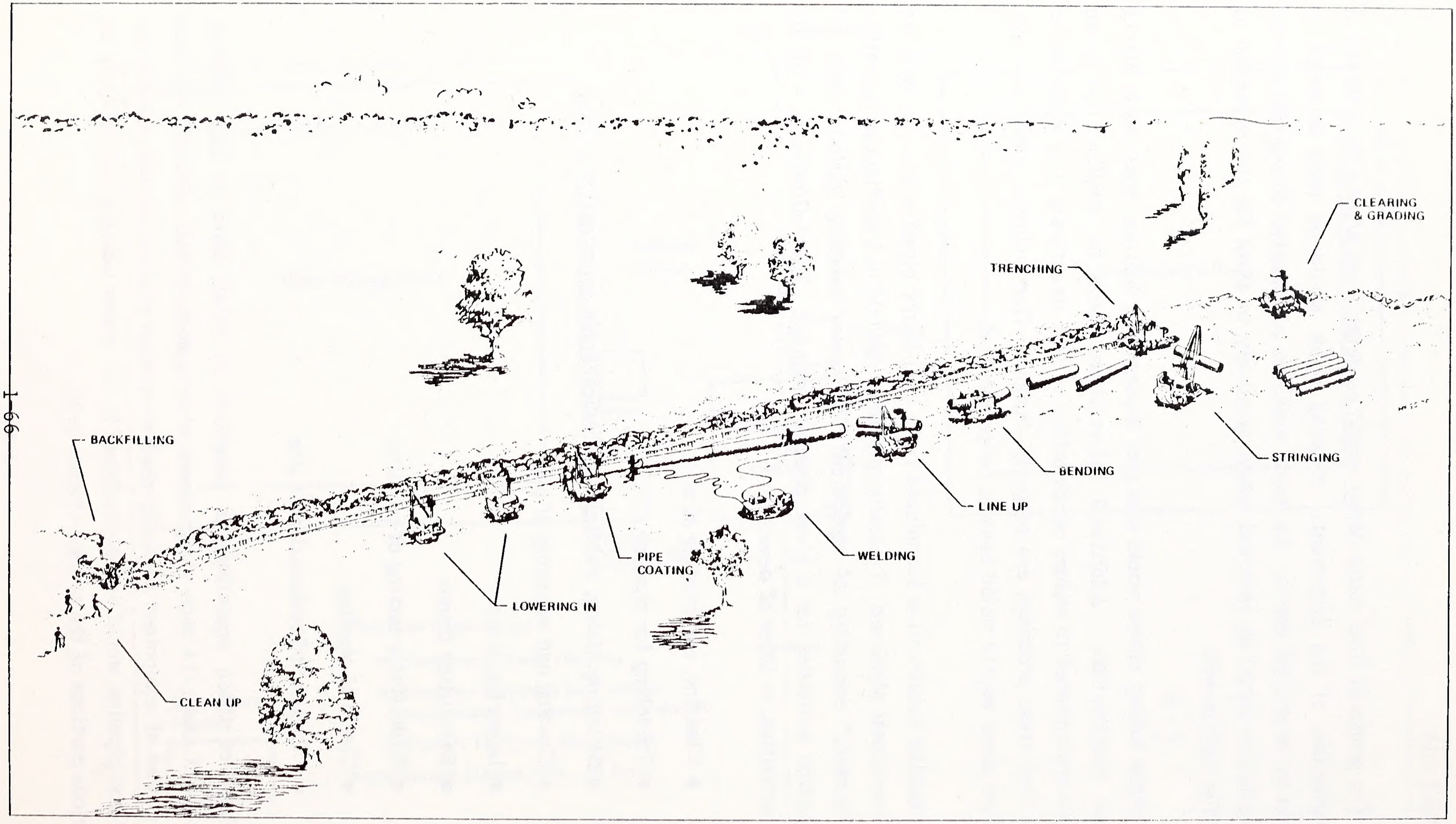


Figure 1-13. TYPICAL MAIN SLURRY PIPELINE CONSTRUCTION SPREAD

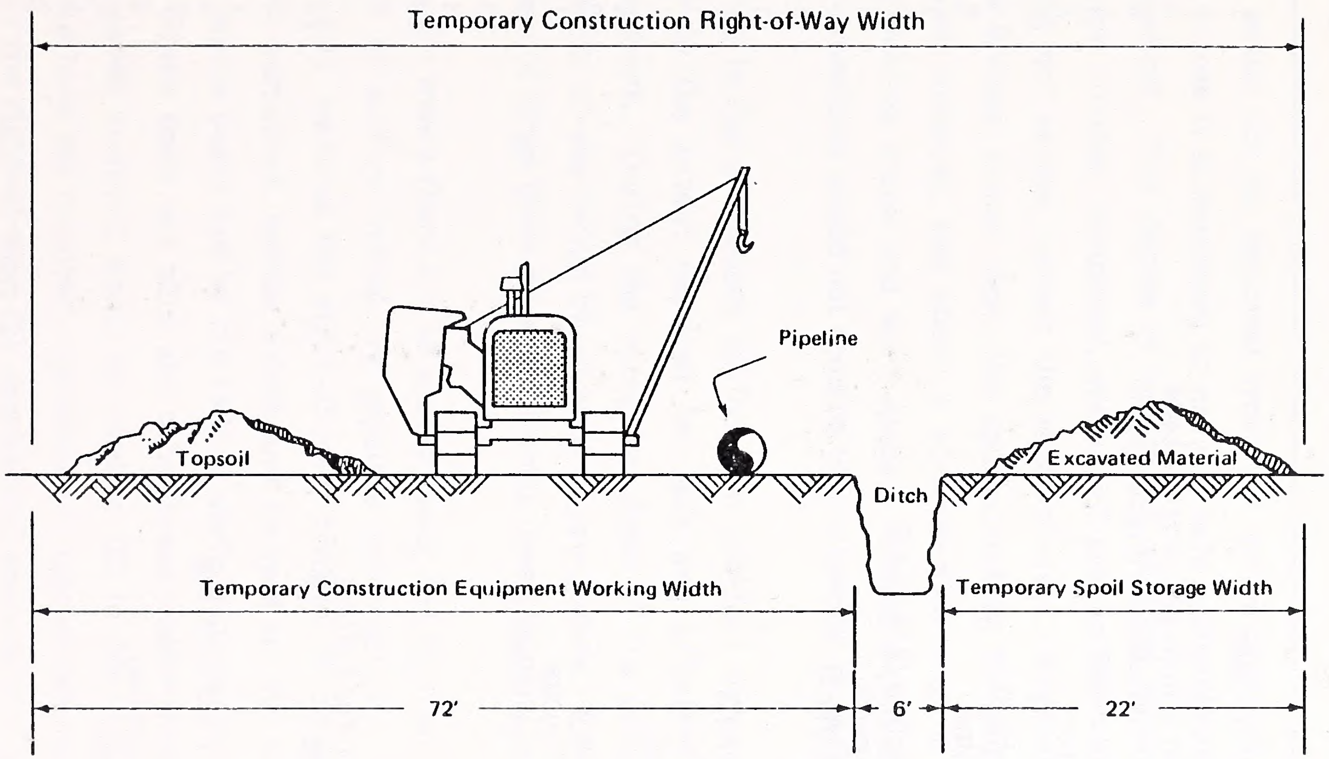

Temporary Construction Right-of-Way Width
Pipeline
Topsoil
Excavated Material
Ditch
Temporary Construction Equipment Working Width
Temporary Spoil Storage Width
72′
6′
22′

Figure 1-14. CONSTRUCTION RIGHT-OF-WAY CROSS SECTION

TABLE 1-16
MAJOR PIECES OF EQUIPMENT REQUIRED FOR EACH SPREAD

Item	Number Required
D-9 Dozer with Ripper	1
D-8 Dozer with Ripper	1
D-8 Dozer with Winch and Angle Blade	5
D-7 Dozer with Winch and Angle Blade	6
D-7 Dozer with Rake	1
D-7 Tow Tractor	1
572 Sideboom	18
Backhoe (3/4-yard)	14
Ditching Machine	2
Backfiller	1
Clamshell Dragline (3/4-yard)	2
Dragline (3/4-yard)	1
Dragline 1-1/4 yard)	2
Motor Grader	1
Motor Crane	1
Bending Machine	1
Cleaning Machine	1
Boring Machine	1
Rock Picker	1
Air Compressor	2
Pipe Coating Trucks	1
Tar Pots for Pipe Coating	7
Pumps	3
Flatbed Truck	3
Pickup	33
Carryall	5
Gin-pole Truck for Lifting	5
Stringing Truck	12
Bus	10
Skid Truck	1
Tar Truck for Pipe Coating	2
Dump Truck (10-yard)	2
Tractor with Lowboy	4
Mechanic Truck	3
Grease Truck	1
Fuel Truck	2
Office Trailer	1
Warehouse Trailer	2
Welding Machines	16
Welding Machine with Wagon	20

Construction noise impacts, such as temporary increases in noise levels, would be distributed over the length of the spread. Heavy equipment and construction activities typically produce noise levels of about 90 decibels at a distance of 50 feet (EPA 1974), assuming a noise attenuation rate to 6 decibels (about the level of normal conversation) within one-quarter mile (EPA 1974).

Vegetation would not be removed from the entire right-of-way but only from those areas where it is necessary to provide safe and efficient operation of construction equipment. The degree of vegetation clearing depends in part on the vegetation type (timber, shrubland, grassland) present in the right-of-way, but clearing would not extend beyond the right-of-way. Vegetation would be cleared from the 6-foot trench line, the approximately 25-foot-wide storage area for excavated material, and about a 50-foot-wide area in forested and wooded areas for vehicle travel and work space. Vehicle travel and work space in shrublands and grasslands would not require total clearing of vegetation.

Trees growing in.the permanent 50-foot and 100-foot rights-of-way would be removed only to the extent required for safe and efficient operation of construction equipment. During the operation phase of the project, the same portions of the rights-of-way would be allowed to revegetate. Exceptions would be made in the case of large trees growing directly over the pipeline.

In remote areas where there are no access roads, the right-of-way would be the primary path of surface travel for pipeline construction. In order that vehicles might safely traverse the right-of-way, bridges or culverts would be constructed, when warranted, across creeks and arroyos on the working side of the right-of-way (where permitted by the federal surface management agency or the landowner). Where there are hills, and other areas where material would be cut away, the removed material would be used to fill in depressions and small valleys. If such methods are required, materials for approaches and fill would be obtained from: (1) the right-of-way; (2) commercial sources (and would have to be transported to the location); or (3) adjacent lands, where permitted by the federal surface management agency or the landowner. Grading would be performed in such a manner as to minimize adverse effects on natural drainage. In steep terrain or in wet areas, where the right-of-way must be graded at two elevations (two-toning) or diversion dams must be built to facilitate construction, the areas would be contoured upon completion of construction to resemble the original grade.

If blasting is necessary, the following safety precautions would be adhered to in all instances:

- In areas of human use, shots would be blanketed (matted).
- Landowners or tenants in close proximity to the shot would be notified in advance so that livestock and other property could be adequately protected.
- Before detonation, a clearance would be made to ensure that construction personnel and equipment and local residents are in no danger.

Where fences are encountered along the right-of-way, adequate bracing would be installed at each edge of the right-of-way prior to cutting the wires and installing a temporary gate. The temporary gate would be constructed so that it could be readily installed, at the landowner's discretion, as a permanent fence section upon completion of construction.

Once the right-of-way had been prepared, ditching operations would begin. For the most part, the 6-foot-wide ditch would be centered on a line 25 feet from one edge of the right-of-way, thus providing 72 feet of working space and 22 feet of area in which to store excavated material. Most of the ditch would be excavated mechanically with ditching machines, backhoes, draglines, and cranes with clamshell buckets. Exceptions to mechanical excavation would include hand digging to locate buried utilities, such as pipelines and cables.

Generally, ditching operations would use only ditching machines in open areas and backhoes near rivers and in tight areas; however, subsurface conditions might require different types of excavation. In areas of loose or unconsolidated rock, the ditch line would be ripped mechanically. (This involves a tractor dragging a long shank (ripper tooth) behind it to dislodge the material. Often, another tractor pushes the tractor equipped with the ripper.) If the material encountered could not be ripped, it would be blasted. In preparation for blasting, unconsolidated material would be removed from the ditch-line end and a series of holes would be drilled by air-powered drills. These drills are generally suspended from a side-boom tractor, which also tows the compressor supplying the air. However, self-propelled drills may be used if a significant amount of drilling must take place in one location. The previously discussed blasting criteria must be met before any shots are detonated.

The topsoil would be saved subject to agreements with landowners and the surface management agency. The topsoil would be cast to the working side of the right-of-way. The ditching machine would then cast the ditch spoil to the opposite or spoil side of the right-of-way so that the two soils do not mix. Upon completion of construction, the ditch would be backfilled, with the topsoil going in last, returning to its original position.

The depth of the ditch would vary with the conditions encountered. The cover from the top of the pipe to ground level would generally be a minimum of 3 feet. When blasting of the ditch is necessary in areas near private dwellings or where people congregate or work, the minimum amount of cover would be 2.5 feet. In open areas where the ditch line must be blasted, the minimum cover would be 1.5 feet. There are also situations in which the ditch would be excavated to depths greater than the stated minimums. For example, in traversing lands where there are definite plans to level the land for irrigation or other purposes, the pipeline would be buried at a depth that would permit the land to be leveled and still provide ample cover. Where the pipeline would cross canals, borrow ditches, or irrigation ditches that are dredged to maintain depth, the pipeline ditch would be excavated to a depth that would permit safe dredging operations. At railroad and highway crossings, the depth of the ditch would conform to the appropriate regulations and the requirements of the appropriate jurisdictional organization. In order to reduce the hazard of accidents, ditching operations would be timed so that the ditch would not remain open for an extended period. In areas where an open ditch would cross range-animal paths, driveways, or rural roads, temporary crossings, such as plank bridges or unexcavated ditch line, would be provided for safe and unimpeded passage.

The maximum pipeline gradient would be determined for each segment according to ground profile and design criteria. Existing coal slurry pipelines have been built with slopes of less than 16 percent. This is a safety precaution designed to avoid plug formation when the line containing slurry is shut down. Plug-forming characteristics of the ETSI coal slurry would be studied to determine the economic slope restriction.

The proposed main slurry pipeline route would cross 58 rivers requiring special permits of which three are considered "scenic" (Table 1-17). The pipeline would be buried in a trench across each of these rivers. Vegetation would be cleared on each bank of the river only as necessary to provide sufficient room for work space and equipment storage (up to 200 x 200 feet on each side). Stream crossings would be constructed during periods of low flow whenever possible or would be timed to eliminate conflicts with critical migration or spawning schedules of any aquatic species.

Specific construction techniques that would minimize the amount of erosion and siltation would be selected for each river crossing. In general, the trench would cross the stream at right angles. Stream flow would be maintained at all times to avoid interference with downstream water uses. The stream banks would be reclaimed to their original profile and would be stabilized to minimize erosion.

In crossing rivers, the ditch would be excavated to such a depth that high water would not affect the pipe through scour action. The ditch would be wide enough so that the coating would not be damaged when the pipe is lowered into the ditch. The sag bends on either side of the river would be a sufficient distance inland from the river bank to ensure that water erosion would not expose them. Construction of water crossings would be made in a manner that minimizes the effects of construction on water flow (the gradient of the stream would be maintained by removing all spoil from the bed upon completion of construction, stream banks would be restored to resemble their original grade, and sand-cement sacks, breakers, or riprap [revetments] would be placed over the pipeline where necessary). The pipeline would be weighted where it is situated underwater to ensure that it remains in the ditch. The river crossings

TABLE 1-17

RIVER AND STREAM CROSSINGS REQUIRING SPECIAL PERMITS: PROPOSED ACTION

	Name	Type Permit	State
1.	North Platte River	404	Nebraska
2.	South Platte River	404	Nebraska
3.	Republican River	404	Nebraska
4.	Walnut Creek	404	Kansas
5.	Arkansas River	404	Kansas
6.	Chikaskia River	404	Oklahoma
7.	Salt Fork/Arkansas River	404	Oklahoma
8.	Arkansas River	404	Oklahoma
9.	Verdigris River	404	Oklahoma
10.	Neosho (Grand) River	10	Oklahoma
11.	Arkansas River-M.K.N.S.	10	Oklahoma
12.	Spaniard Creek	10	Oklahoma
13.	Arkansas River-M.K.N.S.	10	Oklahoma
14.	Lee Creek	10	Arkansas
15.	Frog Bayou	404	Arkansas
16.	Little Mulberry	404	Arkansas
17.	Mulberry River	10	Arkansas
18.	White Oak Creek	404	Arkansas
19.	Spadra	404	Arkansas
20.	Little Piney	404	Arkansas
21.	East Fork Horsehead Creek	404	Arkansas
22.	Horsehead Creek	404	Arkansas
23.	Gum Log Creek	404	Arkansas
24.	Piney Creek	404	Arkansas
25.	Illinois Bayou	404	Arkansas
26.	Point Remove Creek (2)	10	Arkansas
27.	Arkansas River	10	Arkansas
28.	West Fork Point Remove Creek	404	Arkansas
29.	East Fork Point Remove Creek	404	Arkansas
30.	North Fork Cadron Creek	404	Arkansas
31.	Greers Ferry Lake	10	Arkansas

TABLE 1-17 concluded

Name	Type Permit	State
32. Little Red River	404	Arkansas
33. Big Creek	404	Arkansas
34. White River (Newport terminal)	10	Arkansas
35. Cypress Creek	404	Arkansas
36. Fourche La Fave River	10	Arkansas
37. Harris Brake Lake	404	Arkansas
38. Big Maumelle River	404	Arkansas
39. Fourche Creek	404	Arkansas
40. Saline River	10	Arkansas
41. Saline River	10	Arkansas
42. Bayou Bartholomew[a]	10	Louisiana
43. Ouachita River	10	Louisiana
44. Little River[a]	10	Louisiana
45. Red River	10	Louisiana
46. Bayou Boeuf	10	Louisiana
47. Bayou Boeuf & Cocodrie Diversion Channel	10	Louisiana
48. Spring Creek[a]	10	Louisiana
49. Bayou Cocodrie	10	Louisiana
50. Calcasieu River	10	Louisiana
INDEPENDENCE LATERAL		
51. White River	10	Arkansas
NEW ROADS LATERAL		
52. Bayou des Glaises Diversion Channel	404	Louisiana
53. Atchafalaya River	10	Louisiana
54. Bayou Fordoche	404	Louisiana
WILTON EXTENSION		
55. Gulf Intercoastal Waterway-Port Allen Canal	10	Louisiana
56. Bayou Plaquemine	10	Louisiana
57. Bayou Lafourche	10	Louisiana
58. Mississippi River	10	Louisiana

[a] Scenic river.

requiring separate construction crews are noted in Table 1-17. Separate crews would install the pipe ahead of the main-line construction crew.

Generally, roadbeds supporting paved roadways or railroad tracks would be crossed by boring a hole beneath the bed rather than by ditching across the surface. The cutting head (bit) of the auger would be slightly larger than the casing pipe or line pipe. The pipe would advance as the auger advances. Casing would be installed at crossings where required by federal, state, or local authorities or by the railroad owner.

Stringing, bending, welding, coating, and lowering the pipe are phases of pipeline construction that generally follow right-of-way and ditching operations and do not involve additional commitments or alterations of the right-of-way or the ditch. The pipe would be strung along the right-of-way ahead of ditching operations, except in areas where blasting is required, in a manner that allows access to landowners, tenants, and livestock.

The pipe would be bent to fit curves in the ditch line by placing individual joints into a bending machine. The minimum radius of pipeline bends would be determined by code requirements. Generally, pipes with a diameter of 20 inches or more have a minimum bend radius of 30 pipe diameters (ANSI B31.4, Liquid Petroleum Transportation Piping System). Generally, complete bends would consist of a series of small bends, each of which would be made by a pull of the machine at one position on the pipe. Right-of-way and ditch-line conditions may require pipe bends of such short radius that field bending is not practical. In these cases shop-manufactured bends will be used.

The pipe welding would be done in accordance with Standard 1104 of the American Petroleum Institute guidelines. Welding would include elevating the pipe on skids to provide clearance for lineup and welding, and holding it in alignment during the first welding pass. Generally, internal lineup clamps would be used to align the pipe joints except in making repairs and tie-ins, in which case external clamps would be used. All completed welds would be visually inspected before the application of pipe coating. The frequency of radiographic inspection would meet or exceed Standard 434.8.5 of the American National Standards Institute.

The pipe would be coated, wrapped, and lowered directly into the ditch whenever possible. When necessary, however, the pipe would be placed on skids beside the ditch, then lowered into the ditch. In rocky areas, the bottom of the ditch would be padded with fine soil to provide a uniform bearing for the pipe. Once the pipe is in the ditch, it would be shaded, where necessary, with fine materials to protect the wrap during backfill operations.

Backfilling, using the excavated material, would be done in such a manner as to ensure that the space below and beside the pipe is completely filled. Backfill material that could not be placed in the ditch would be crowned on top of the ditch to compensate for future settling.

Once the ditch has been backfilled, the right-of-way and any other affected areas would be cleaned up. The right-of-way would be graded and fences repaired. In areas where topsoil has been salvaged, it would be moved to the top of the ditch line.

All disturbed surfaces would be contoured to resemble their preconstruction grade. If required, reseeding would be done and fertilizers would be applied. Erosion-control devices would be constructed on steep slopes on the right-of-way and along any cuts made through unconsolidated materials. Erosion-control devices that may be used include, but are not limited to, water bars, riprap, terracing, sand-cement sacks, and fencing. Access roads that are not required for future operations would be removed, and the road beds would be restored to approximate their preconstruction state (Section 1.D.).

The pipeline would be cathodically protected by the pipe coating, rectifiers, and anodes. Rectifiers would be mounted on a pole adjacent to the right-of-way, with its associated anodes buried. Anodes would be buried in the right-of-way with a small (about 3 inches in diameter and 3 feet in height) pole that has test leads exposed at the surface. (Exact locations of these cathodic protection devices cannot be determined until the pipeline is installed and the proper tests conducted.)

For sections of pipe to be placed beneath railroads, highway rights-of-way, and rivers, all welds would be radiographically inspected before installation. The entire pipeline would be hydrostatically tested to 125 percent of maximum operating pressure. The test water would be obtained through agreements negotiated with local authorities controlling the water resources. The estimated amount of water that would be required for testing is a maximum of 1650 acre-feet. The exact amount required would depend on the testing procedures used. The test water would be disposed of in accordance with federal, state, and local agency requirements.

During pipeline construction, the contractor must establish a series of spread headquarters in communities at intervals along the pipeline route. The temporary headquarters are expected to be in communities close to the pipeline and at intervals of approximately 100 miles. Table 1-18 lists the communities that are likely to be the pipeline construction spread headquarters, and Table 1-19 lists communities near proposed pump station sites. Construction workers would live in local motels, rented houses, or personal trailers/pickup campers, and other available lodging. Transportation to the construction site would be by bus, car pools, privately owned vehicles, or other available means.

Pump Stations. Construction of the 23 slurry pump stations (3 of which are located within the preparation plant boundaries), during 1983 and 1984, would disturb approximately 500 acres of land. The construction work force would peak at 1970 in mid-1984 (Table 1-4).

Pump stations would be located along the slurry pipeline route to provide the required pumping pressure, as shown in Table 1-15 (also see the strip maps in Appendix A of the EIS). A plot plan of a typical pump station is shown in Figure 1-11.

The major facilities typically provided at a pump station include the following:

- Water storage pond: A lined pond containing a volume of water equal to 1.25 (or more) times the upstream or downstream pipeline volume to the next pump station, for flushing the line during various operations.

TABLE 1-18

COMMUNITIES NEAR LIKELY PIPELINE CONSTRUCTION SPREAD HEADQUARTERS: PROPOSED ACTION

Community	County/Parish	State
Gillette	Campbell	Wyoming
Wright	Campbell	Wyoming
Lusk	Niobrara	Wyoming
Scottsbluff	Scotts Bluff	Nebraska
Ogallala	Keith	Nebraska
McCook	Red Willow	Nebraska
Hays	Ellis	Kansas
Kingman	Kingman	Kansas
Ponca City	Kay	Oklahoma
Pryor	Mayes	Oklahoma
Fort Smith	Sebastian	Arkansas
Russellville	Pope	Arkansas
Batesville	Independence	Arkansas
Pine Bluff	Jefferson	Arkansas
Monroe	Ouachita	Louisiana
Alexandria	Rapides	Louisiana
Lake Charles	Calcasieu	Louisiana
Baton Rouge	E. Baton Rouge	Louisiana

TABLE 1-19

COMMUNITIES NEAR PROPOSED PUMP STATION SITES: PROPOSED ACTION

Station	Community	County/Parish	State
NR	Gillette	Campbell	Wyoming
NA	Wright	Campbell	Wyoming
N-1	Lusk	Niobrara	Wyoming
PMBC-1	Wright	Campbell	Wyoming
P-2	Lusk	Niobrara	Wyoming
P-3	Lusk	Niobrara	Wyoming
P-4	Oshkosh	Garden	Nebraska
P-5	McCook	Red Willow	Nebraska
P-6	Oberlin	Decatur	Kansas
P-7	Stafford	Stafford	Kansas
P-8	Ponca City	Kay	Oklahoma
PMB-9	Pryor	Mayes	Oklahoma
P-10	Muskogee	Muskogee	Oklahoma
P-11	Fort Smith	Sebastian	Arkansas
PMB-12	Atkins	Pope	Arkansas
PMB(I)-2	Heber Springs	Cleburne	Arkansas
PMB-13	Pine Bluff	Jefferson	Arkansas
PM-14	Warren	Bradley	Arkansas
PM-15	Monroe	Ouachita	Louisiana
PM-16	Olla	La Salle	Louisiana
PM-17	Alexandria	Rapides	Louisiana
PM-18	Oberlin	Allen	Louisiana
PM(NW)-2	New Roads	Pointe-Coupee	Louisiana
PM(NW)-3	Plaquemine	Iberville	Louisiana

- Agitated slurry storage tank and reinjection system: A storage tank large enough to hold 5 minutes of design pipeline flow, with a charge pump to reinject slurry into the main line.
- Pump-house building: A facility that houses the main-line pumps and drivers, miscellaneous piping systems, sumps, a control room, cooling-water pumps, electric motor control and switchgear, inhibitor system, and station maintenance facilities.
- Water-pump house: A facility that houses the utility and flushing water pumps and drivers.
- Cooling system: A cooling tower and associated equipment to provide cooling for main-line pump lubricating systems and other station equipment.
- Electric substation: A facility that provides the link between the power source and the load center, including transformers and other associated electrical equipment.
- Water well: A well to provide potable water for domestic and utility uses and for storage pond evaporation makeup.
- Waste treatment: A septic tank for the disposal of sanitary wastes.

All exposed structures would be designed so that their configurations or forms and material types, textures, and colors would reduce their visibility.

In addition, emergency slurry storage ponds would be provided at the first main-line pump station (at Jacobs Ranch) and at pump station P-2. The volume of each pond would be 1.25 times the volume of the slurry gathering pipelines and 1.25 times the volume of main-line section 1 (46.1 miles), respectively. Remix tanks sized to hold 30 minutes of design flow would be provided at two main-line pump stations in the Jacobs Ranch-Pryor section. These tanks would be provided to suppress slurry density fluctuations during shutdown-restart and would not be used in normal operations.

A safety loop would be provided at each slurry preparation plant. These loops, each consisting of a 400-diameter-length of pipe of the same diameter as the pipeline, would allow measurement of slurry density, flow, and pressure drop per unit length. These data would be continuously monitored to ensure that only specification slurry is admitted to the pipeline. Slurry density would be measured at pump stations equipped with remix tanks and at other locations as necessary throughout the pipeline system.

All pump stations would use positive-displacement reciprocating pumps driven by electric motors. Each station would be provided with one spare pump unit to allow scheduled periodic maintenance during continuous operation. At main-line pump stations, a maximum of four pumps per station would be driven through variable-speed couplings. The remaining pumps would be direct-coupled to the motor through an appropriately sized gear reducer. Bypass of intermediate pump stations would be permitted in multistation pipeline sections.

Pump station construction would produce noise levels similar to those of pipeline construction.

Operation, Maintenance, and Abandonment

Acreage. During project operation, the coal slurry pipelines and pump stations would require about 21,528 acres of land. Of this, approximately 500 acres would be required for the 23 pump stations, 3 of which are located within the preparation plant boundaries. Each 25-acre plot would be fenced.

Work Force. Approximately 75 people would be needed to operate the pipeline and associated pump stations.

Maintenance. The right-of-way would be periodically inspected by an aerial patrol. Surface traffic would be limited to workers performing valve maintenance and emergency repairs to the pipeline or erosion-control devices. Details of the spill control measures are provided in Section 1.J. At project termination, all surface facilities would be removed and the disturbed acreage reclaimed.

Noise. Noise levels inside the pipeline pump stations are projected to be similar to those in the Black Mesa pipeline pump stations, which may be as high as 104 decibels (OTA 1977). Based on this level, with a 30-decibel attenuation by the station wells (OTA 1977) and a 6-decibel attenuation per doubling distance, the sound level at 100 feet would be about 44 decibels.

1.G.4 DEWATERING PLANTS

Dewatering plants would be located at each delivery terminal to separate the coal from the water by a process of heating, centrifugation, and heat exchanger and cooling drying. Extracted water would be further treated by flocculation to remove fine suspended coal particles. Figures 1-15 and 1-16 show the flow scheme and layout for the dewatering plants.

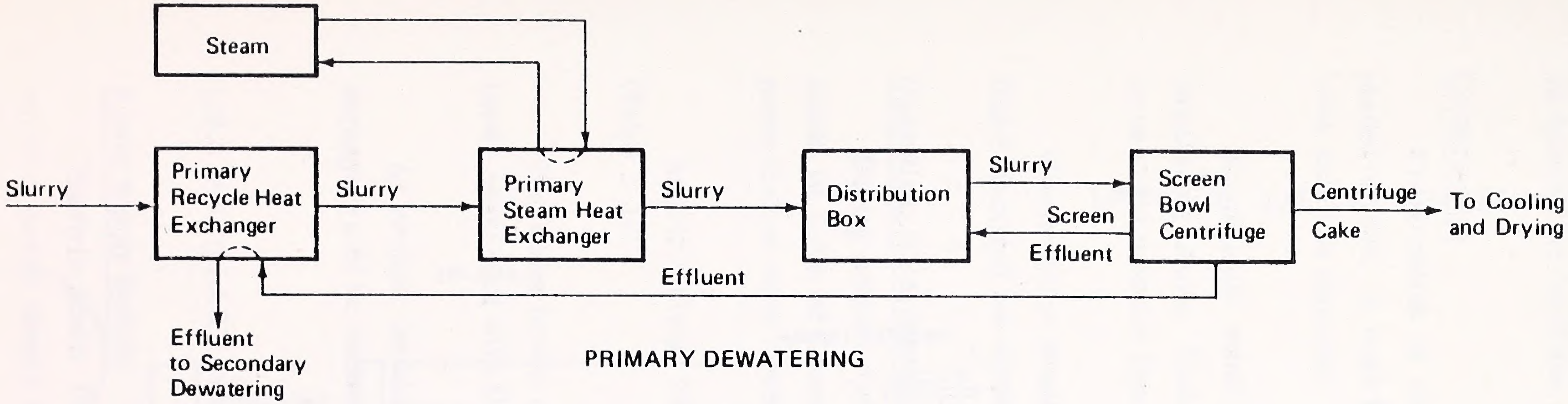
Slurry holding tanks, with a capacity equal to 8 hours of design slurry feed rates for the dewatering plant, would be located at each facility. This storage would provide buffer capacity between pipeline and dewatering plant operations.

In all systems, slurry would first be pumped from the terminal storage tanks to a two-stage heat exchanger system, then fed (at approximately 200°F) to screen bowl centrifuges. The cake product from the screen bowl centrifuge, containing 12 percent surface moisture, would be further dried by air alone in fluid-bed cooler-dryers. The dry cake would be conveyed to a one-hour surge hopper, and from there the coal would be fed to product conveyors to storage for combustion.

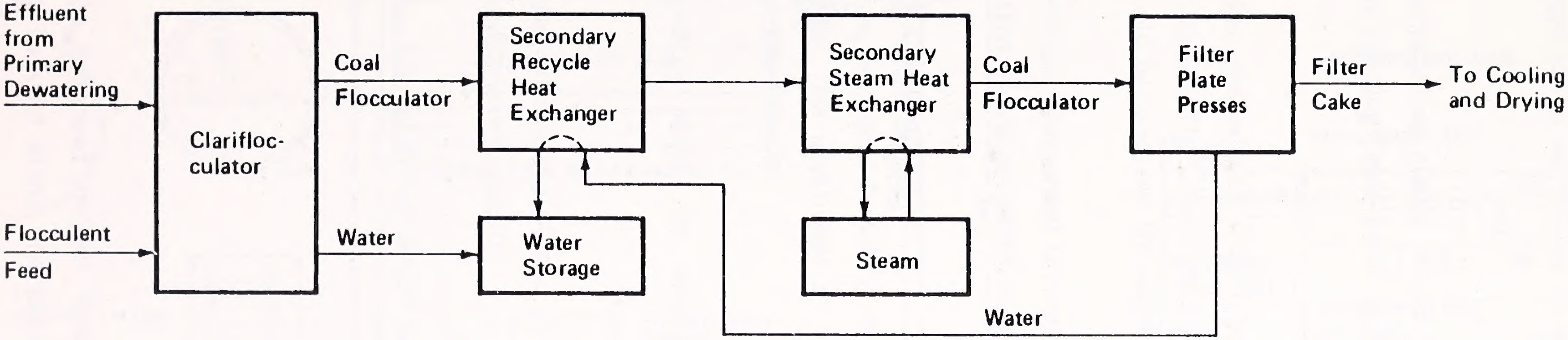
The effluent from the screen bowl centrifuges would be cooled in the heat exchangers and fed into a clariflocculator to reclaim the solids that were not removed in the primary dewatering circuit. The clariflocculator overflow at each terminal would be pumped to customer facilities for cooling-water makeup or other in-plant use. The clariflocculator underflow sludge would be dewatered and combined with the cake from the primary centrifuges and sent to storage.

A weighing and sampling station would be provided on the conveyor system to coal storage. The data taken at this point would allow determination of the total Btu's transferred from the dewatering plant to the coal customer.

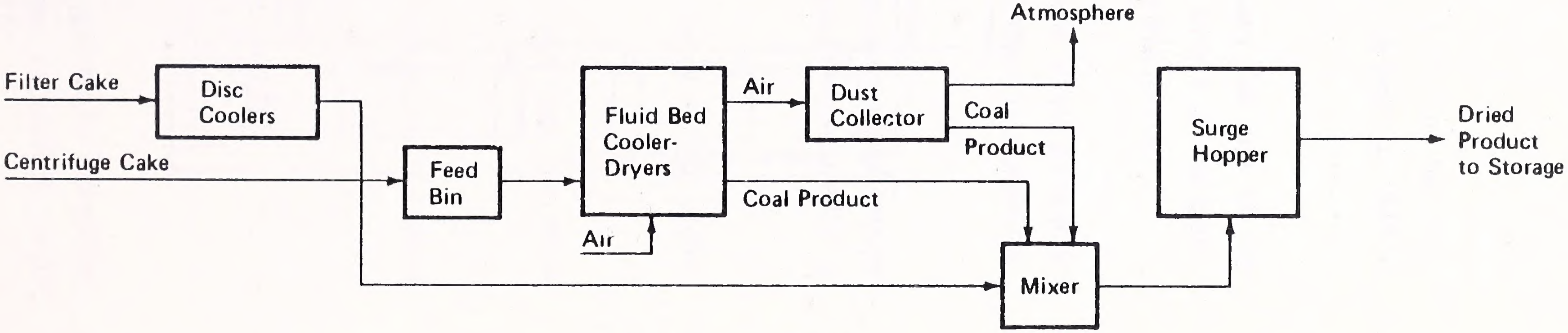
Each dewatering plant would require low-pressure steam to operate the heat exchangers. Steam would be available from the power plants. A pipe would be constructed from the power plant to supply the steam to the dewatering facility.



PRIMARY DEWATERING

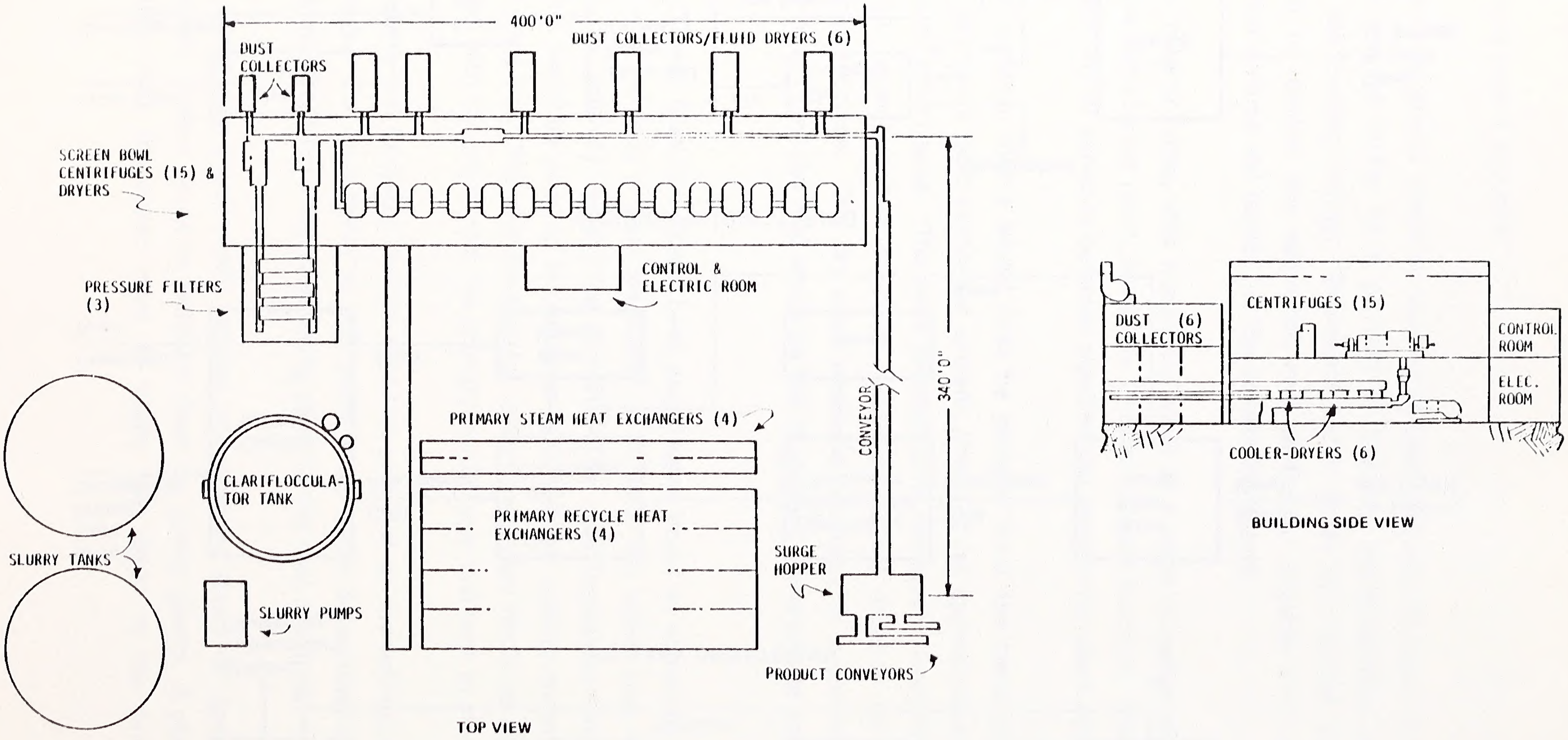


SECONDARY DEWATERING



COOLING AND DRYING

Figure 1-15. FLOW SCHEME FOR TYPICAL DEWATERING PLANT



TOP VIEW

BUILDING SIDE VIEW

Figure 1-16. TYPICAL DEWATERING PLANT

Stand-by electric boilers would be constructed to ensure a steam source at all dewatering facilities, should the power plants be shut down.

Construction

Construction of the dewatering plants would begin in 1983 and be completed in 1989. A work force ranging from 58 in early 1983 to a peak of 1332 in 1984 would be required.

No unusual construction procedures would be necessary for any of the dewatering plants. Since each facility would be associated with a power plant, no new transmission lines would be required for supplying electric power.

Construction would produce temporary increases in noise levels similar to those discussed for construction of the preparation plants and the slurry pipeline.

Operation, Maintenance, and Abandonment

During project operation, a typical 5-MMTA dewatering plant would occupy about 10 acres of fenced land. An additional 25 acres would be required if a pump station were located at the facility.

Approximately 267 people would be required to operate the plants (Table 1-12).

The noise levels at the dewatering plants would be lower than the noise levels associated with the nearby power plants.

At project termination, all facilities would be removed and the disturbed acreage would be reclaimed.

1.G.5 ANCILLARY FACILITIES

Power Supply System

Electric power for the proposed project would be obtained by extending existing power supply lines located along the route. These extensions would carry high-voltage cables to the plant boundaries, where a substation yard would contain stepdown transformers and a low-voltage distribution system to supply the various equipment areas. Table 1-20 lists system power requirements and sources.

Dewatering facilities located at power plants would tie into existing substations for power.

Communications System. The communications system would consist of line-of-sight microwave radio equipment installed between the major project facilities and would provide the following services:

- Fixed-station voice communication: Telephone service for operations personnel
- Mobile communication: Radio communication for maintenance bases and their associated field units
- Data communication: Transmission of digital and analog data for the supervisory control system

The proposed microwave communications system would consist of two terminal stations and approximately 66 repeater stations. Each terminal or repeater station would include the equipment shown in Figure 1-17. Figure 1-18 shows a typical self supporting microwave tower assembly.

Microwave repeater antennas would be mounted on towers spaced about 30 miles apart along the entire pipeline route. Their general locations are shown on the strip maps in Appendix A of the EIS. Consideration would also be given to the flight routes of migrating birds in determining the exact location. Each tower would also be equipped with omnidirectional receiver antennas to pick up transmissions from mobile units traveling the route. The towers could range in height from 40 to 360 feet, depending on the topography. Some of these towers would require Federal Aviation Agency approval (Federal Aviation Regulations, Part 77, Subchapter B). Communication sites that lie off the primary system or between towers, such as mine sites, valve locations, and river crossings, would be served by narrow-band radio installations transmitting to the nearest microwave tower.

TABLE 1-20

POWER REQUIREMENTS AND SOURCE IDENTIFICATION: PROPOSED ACTION

Facility	Kilowatt Demand	Source	Transmission Line (Miles)
Water-Well Field	9,500	115 kV - Niobrara Electric Assoc., Inc.	30
Pump Station N-1 (water)	11,300	69 kV - Niobrara Electric Assoc., Inc.	Tap
N. Rawhide Prep. Plant	8,000	69 kV - Tri-County Electric Assoc., Inc.	12
Pump Station N-2 (water)	300	69 kV - Tri-County Electric Assoc., Inc.	Tap
N. Rawhide Pump Station	4,300	69 kV - Tri-County Electric Assoc., Inc.	12
N. Antelope Prep. Plant	16,000	69 kV - Tri-County Electric Assoc., Inc.	Tap
Pump Station N-3 (water)	500	69 kV - Tri-County Electric Assoc., Inc.	Tap
N. Antelope Pump Station	1,500	69 kV - Tri-County Electric Assoc., Inc.	Tap
Jacobs Ranch Prep. Plant	36,000	69 kV - Tri-County Electric Assoc., Inc.	Tap
Pump Station PMBC-1	10,300	69 kV - Tri-County Electric Assoc., Inc.	Tap
Pump Station P-2	8,800	69 kV - Niobrara Electric Assoc., Inc.	Tap
Pump Station P-3	8,800	69 kV - Niobrara Electric Assoc., Inc.	34
Pump Station P-4	8,800	34.5 kV - Wheat Belt Public Power District	3
Pump Station P-5	8,800	69 kV - McCook Public Power District	10
Pump Station P-6	8,800	115 kV - Norton/Decatur Electric Cooperative	11
Pump Station P-7	8,800	115 kV - Central Kansas Electric Cooperative, Inc.	Tap

TABLE 1-20 continued

Facility	Kilowatt Demand	Source	Transmission Line (Miles)
Ponca City Dewatering Plant	10,000	Oklahoma Gas & Electric Co.	Tap
Pump Station P-8	12,000	Oklahoma Gas & Electric Co.	Tap
Pryor Dewatering Plant	7,200	Grand River Dam Authority	Tap
Pump Station PMB-9	3,800	Grand River Dam Authority	Tap
Muskogee Dewatering Plant	8,000	Oklahoma Gas & Electric Co.	Tap
Pump Station P-10	8,800	Oklahoma Gas & Electric Co.	Tap
Pump Station P-11	8,500	69 kV - Cookson Hills Cooperative, Inc.	4
Pump Stations PMB(I)-1, and PMB-12	11,100	161 kV - Arkansas Power & Light Co.	Tap
Pump Station PMB(I)-2	3,100	161 kV - Arkansas Power & Light Co.	4
Independence Dewatering Plant	8,000	Arkansas Power & Light Co.	Tap
White Bluff Dewatering Plant	8,000	Arkansas Power & Light Co.	Tap
Pump Station PMB-13	6,100	Arkansas Power & Light Co.	Tap
Pump Station PM-14	5,500	115 kV - Arkansas Power & Light Co.	2
Pump Station PM-15	6,100	115 kV - Louisiana Power & Light	6
Pump Station PM-16	6,100	34.5 kV - Louisiana Power & Light	5
Pump Stations PM(B)-1, PM-17, and PM (NW)-1	8,600	115 kV - Central Louisiana Electric Co.	2

TABLE 1-20 concluded

Facility	Kilowatt Demand	Source	Transmission Line (Miles)
Boyce Dewatering Plant	3,800	Central Louisiana Electric Co.	Tap
Pump Station PM-18	3,100	34.5 kV - Central Louisiana Electric Co.	2
Lake Charles Dewatering Plant	7,000	Gulf States Utilities Co.	Tap
New Roads Dewatering Plant	4,000	Cajun Electric Co.	Tap
Pump Station PM(NW)-2	4,700	Cajun Electric Co.	Tap
Pump Station PM(NW)-3	2,500	69 kV - Gulf States Utilities Co.	Tap
Wilton Dewatering Plant	7,500	Louisiana Power & Light Co.	Tap

Note: Tap includes ≤1 mile of new transmission line.

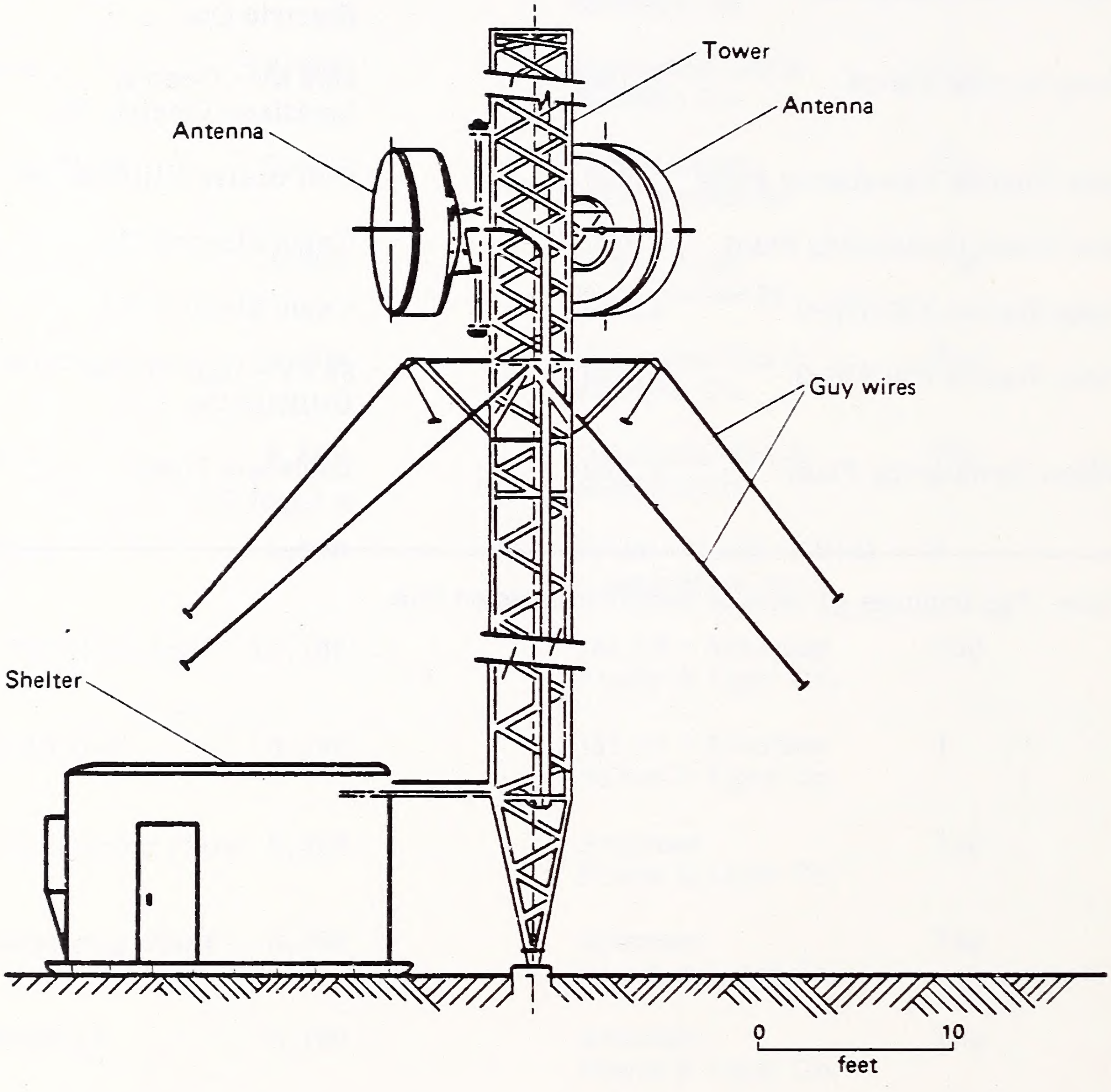


Figure 1-17. TYPICAL MICROWAVE REPEATER SITE

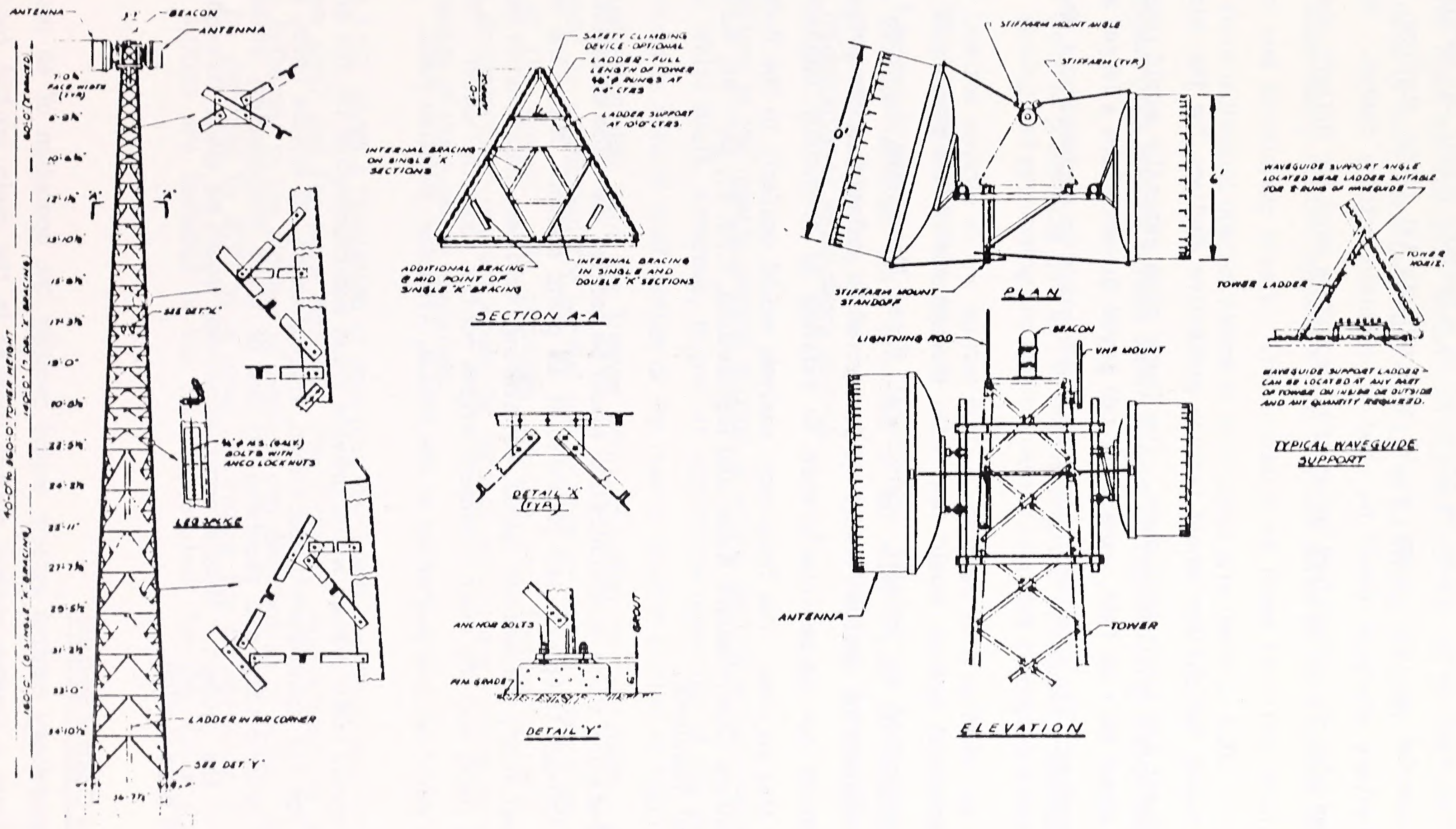

ANTENNA
BEACON
ANTENNA
7'-0½" FACE WIDTH (TYP.)
8'-9½"
10'-6½"
12'-1½"
13'-10½"
15'-6½"
17'-3½"
19'-0"
20'-8½"
22'-5½"
24'-2½"
25'-11"
27'-7½"
29'-5½"
31'-2½"
33'-0"
34'-10½"
36'-7½"
40'-0" to 360'-0" TOWER HEIGHT
60'-0" (X BRACING)
140'-0" (7 DBL. 'K' BRACING)
180'-0" (9 SINGLE 'K' BRACING)
"A"
"A"
SEE DET. "X"
⅝" Ø H.S. (GALV.) BOLTS WITH ANCO LOCK NUTS
LEG SPLICE
LADDER IN FAR CORNER
SEE DET. "Y"
SAFETY CLIMBING DEVICE · OPTIONAL
LADDER - FULL LENGTH OF TOWER ⅝" Ø RUNGS AT 12" CTRS.
LADDER SUPPORT AT 10'-0" CTRS.
INTERNAL BRACING ON SINGLE 'K' SECTIONS
ADDITIONAL BRACING @ MID POINT OF SINGLE "K" BRACING
INTERNAL BRACING IN SINGLE AND DOUBLE 'K' SECTIONS
SECTION A-A
DETAIL "X" (TYP.)
ANCHOR BOLTS
GROUT
FIN. GRADE
6"
DETAIL "Y"
STIFFARM MOUNT ANGLE
STIFFARM (TYP.)
10'
6'
STIFFARM MOUNT STANDOFF
PLAN
LIGHTNING ROD
BEACON
VHF MOUNT
ANTENNA
TOWER
ELEVATION
WAVEGUIDE SUPPORT ANGLE LOCATED NEAR LADDER SUITABLE FOR 8 RUNS OF WAVEGUIDE
TOWER HORIZ.
TOWER LADDER
WAVEGUIDE SUPPORT LADDER - CAN BE LOCATED AT ANY PART OF TOWER ON INSIDE OR OUTSIDE AND ANY QUANTITY REQUIRED.
TYPICAL WAVEGUIDE SUPPORT

Figure 1-18. SELF-SUPPORTING MICROWAVE TOWER ASSEMBLY AND WAVEGUIDE MOUNTING DETAIL

Power at each tower would be provided by a battery plant. At locations where commercial electric power would be available (at pump stations, for example), battery chargers would be used to maintain battery charge. Elsewhere, thermoelectric generators (solar cells) would be used for battery charging.

Each tower installation would include protective shelters for the microwave equipment and alarm equipment. The tower sites generally would require an area of about 50 x 50 feet, except for tall guyed towers where a larger area might be required. The area surrounding the tower would be enclosed by a chain-link fence.

The proposed system would use radio frequencies in the portion of the spectrum designated as "Private Operational, Fixed Microwave Services." A frequency engineering analysis would be performed to assure that the proposed facilities would not cause interference to existing or previously applied-for stations in this service. The frequency analysis would conform to the Federal Communications Commission's Rules and Regulations, CFR 47, part 94, subpart C, Technical Standards.

Fixed-station voice communication would be carried via voice channels and conducted through telephone sets provided at all pump stations, main-line valve stations, coal slurry preparation plants, dewatering facilities, maintenance bases, water-well field, and the main communications control room in Denver. These telephones would be interconnected at the Atkins, Arkansas, junction point.

The mobile radio system would provide voice communication for the entire pipeline. For the maintenance operations, approximately 40 mobile units, each capable of transmitting and receiving on one of three frequencies, would be provided for the project. Mobile communications would be made through the appropriate base station.

Supervisory Control System

A supervisory control system would monitor the operation of all project facilities from a master control station located in the main control room in

Denver. The main control room would also operate and control all the water and slurry pipelines in the system (see Section 1.J. for additional details).

The supervisory control system would monitor selected data points of the preparation and dewatering plants. The operation of these facilities would be controlled from individual control rooms at each plant site (Section 1.J).

The supervisory control system would consist of the following major items:

- Central processing unit at the master station: A computer capable of storing and processing the system data, and a disk storage system.
- Control console at the master station equipped with cathode ray tube display units and data loggers.
- Remote terminal units provided at all sites would be capable of processing data for either operation instructions or transmission of information to supervisory control.

In addition to the master control station, a backup control system would be provided at White Bluff, Arkansas, to permit continuous operation of the slurry pipeline system in case of malfunction of the master control station or failure of the communication link with the Denver communication control room. Procedures would be established for normal and emergency startup, operation, and shutdown of the system. By thorough training and familiarity with the emergency procedures, operators would be able to handle any routine or non-routine situation in the pipeline operation.

Table 1-12 gives a tabulation of operating personnel, by discipline, for the headquarters staff and for each district. The differing requirements of each district are reflected in the number of persons and distribution of skills. Eight persons to be provided to ETSI by a local contractor for maintenance of the water-well system are included in the number required for the water supply system.

1.H SYSTEM OPERATION

The operation of such a system--including (1) start-up, (2) steady-state flow, (3) shutdown, and (4) restart after shutdown--is described below.

1.H.1 START-UP

After completion of construction and testing of all components, the system would be prepared for operation by filling the line with water from the Niobrara well field. During this process the storage ponds at each coal slurry preparation plant and at each pump station would be partially filled; the balance would be made up from the displaced water in the pipeline upstream from each pump station.

The filled line would then be ready to receive coal slurry.

Coal from each mine would be ground to a size suitable for suspension in the water to form a slurry. The ground coal would then be mixed with water in the ratio of approximately 50 percent each by weight and kept in suspension in the large agitated slurry storage tanks. (See Section 1.G.1 for a more detailed description.)

The agitated slurry mixture would then be delivered to the pipeline, and positive displacement pumps would fill the pipeline with coal slurry by displacing the water in each section of the line. It is during this period that the remaining volume of the pump station storage ponds would be filled by displaced water from the pipeline, thereby minimizing the quantity of water discharged. With the system in steady-state operation, coal slurry would be delivered around the clock to each delivery point.

1.H.2 STEADY-STATE OPERATION

Operation of the system would be directed from a pipeline control center in Denver, Colorado. A computerized system would monitor the data input from the preparation and dewatering plants, and control the pumping speeds required to maintain the flow, and the volume of coal delivered to each dewatering plant. Water would be removed from the coal slurry at the dewatering plants by a system of centrifugation, chemical precipitation, mechanical pressing, and drying. The dried coal would be delivered to the power plants, and the separated water would be treated and used in the power plant's cooling-water systems.

1.H.3 SYSTEM SHUTDOWN

Two kinds of shutdowns are contemplated: planned and emergency. A planned shutdown would be scheduled for a slurry pipeline lateral to a utility when the utility is about to undergo a routine maintenance turnaround. Similarly, either of the two slurry gathering lines in Wyoming could be scheduled for a shutdown if a mine went on strike or if the shippers (utilities) using the coal from the mine to supply the slurry gathering line were scheduled to shut down for turnaround.

Planned shutdowns would be performed for any line segment (main-line pipe between two pump stations) by using water from the pump station storage pond located immediately upstream to displace slurry from the line segment. Once a line segment is full of water, the upstream pump station can be shut down. In practice, the water from the storage pond would be pumped with a centrifugal transfer pump into the suction line of the adjacent main-line slurry pump station. The main-line pumps would then push the water to displace all the slurry to the pump station immediately downstream, where piping and valving water from its adjacent pond would be used to continue the displacement of the slurry downstream.

An emergency shutdown is normally of short duration (less than 24 hours). This time period may vary depending on operating experience, system configuration, pipeline profile, slurry quality, and other criteria downstream from the shutdown point. It could be caused, for example, by a power outage or multiple equipment failure. A managerial decision would choose one of two major options: implement the procedure described above for planned shutdown, or simply permit the coal to settle in the slurry pipeline. The former option is preferable when the shutdown is anticipated to be of long duration. The latter option would be selected for short shutdowns, as it permits rapid resumption of operations and reduces the power consumption and system unavailability associated with displacing the slurry with water.

During emergency shutdown the appropriate actions would be taken to identify the problem, correct it, and resume operations without discharging coal from the pipeline (except at the terminals, as planned).

1.H.4 SYSTEM RESTART

For restarting a pipeline lateral after a scheduled shutdown, the slurry pumps would be activated and the stationary water in the lateral displaced with slurry from the main pipeline.

When the entire system has been subjected to a scheduled shutdown and is filled with water, restart would be done progressively. First, slurry would be introduced from the preparation plant slurry tanks at pump station PMBC-1, displacing the water from line segment 1 into the downstream pond. When the slurry arrives at pump station P-2, these pumps would be reactivated and the water from segment 2 would be displaced into the downstream pond (at pump station P-3) as the slurry enters that section. This procedure would take place until all pump stations are operational and the entire system is again filled with slurry and all ponds are replenished. Refer to strip maps in Appendix A of the EIS for the location of pump stations.

To resume operation after an emergency shutdown (i.e., the pipeline contains settled coal and supernatant water), two restart procedures are available. The selection of a procedure depends on conditions of the shutdown, slurry characteristics, profile of the restart section, and time span of the shutdown. Normal restart would consist of slowly reactivating the upstream pump station, using slurry held in the storage tanks. The second pump station would be activated as soon as pressure communication has been established. The entire pipeline would be started up in this sequential mode, and the settled coal material would gradually be resuspended as flow reaches the design velocity.

Alternatively, a section filled with settled coal could be restarted by injecting water into the pipeline, using the main-line pumps, until the entire system is brought up to design velocity and the coal material is again properly resuspended. Following this resumption of design flow rate, slurry would be substituted for water at pump station PMBC-1. Normal operations would thereby be resumed. Each of these restart procedures has been routinely and successfully used on existing coal slurry and mineral pipelines in operation throughout the world, such as the Black Mesa pipeline and the Samarco pipeline (transporting iron concentrate in Brazil).

1.I SYSTEM NONROUTINE OPERATIONS

The coal slurry transportation system would be operated as an integrated system from a central control room located in Denver. A backup system, with a control room, would be located at White Bluff, Arkansas; it would take over in case of failure of the main supervisory control system or interruption of communications. Procedures would be established for normal and emergency start-up, operation, and shutdown of the system. By thorough training and familiarity with the emergency procedures, operators would be able to handle any nonroutine situation in the pipeline operation.

Each pump station would have sufficient pumping capacity so that the system could continue to operate (at reduced flow and for a short duration) with a loss of up to 40 percent of pumping capacity at any pump station.

The general operating philosophy is that the system would operate at reduced flow as necessary due to nonoperational periods and would shut down completely only in the event that reduced flow could not be maintained. In the event of a system shutdown, the pump stations downstream of the shutdown point would continue to pump slurry or water to maintain the downstream flow as long as possible or to flush the downstream section of pipeline.

The following sections discuss the various nonroutine operating cases in greater detail.

1.I.1 NONOPERATIONAL MAIN SLURRY PIPELINE PUMP STATION PMBC-1

The first main slurry pipeline pump station would be located within the Jacobs Ranch preparation plant. The station would be effectively isolated from the slurry gathering system and the preparation plant by storage tanks, which would provide buffer capacity between the gathering system and the main line. The station is designed to operate from storage tanks only, so that the supply of slurry to the remainder of the line would stop if PMBC-1 were not operating.

When main slurry pipeline pump station PMBC-1 is nonoperational, the pipeline would immediately switch to water at P-2 and continue to operate at normal flow with water. When the slurry in the section of line between that station and the next downstream station is displaced by the water, the upstream station would be shut down. This procedure would be followed sequentially down the pipeline until either PMBC-1 is again operational or the entire line is full of water and shut down. Similar procedures would be followed for each of the remaining sections of the system except for single pump station sections, where the line would have to be shut down full of slurry.

1.1.2 NONOPERATIONAL INTERMEDIATE PUMP STATION

In the event of a nonoperational main slurry pipeline pump station, with the exception of station PMBC-1, the main slurry pipeline could operate at reduced flow, bypassing the nonoperational pump station. Similarly, the lateral sections of the main slurry pipeline could operate at reduced flow, bypassing the nonoperational pump station — except for the initial pump station, which could not be bypassed. Single pump station sections would also have to be shut down in case of the loss of a pump station.

The nonoperational station would be bypassed and the pipeline would continue to operate but at a reduced flow of about 75 percent of normal. Adjustments would be made in the pumping capacity of each station down the line to accommodate the reduced flow. In the event that two nonadjacent pump stations were nonoperational, the system would continue to operate at reduced flow as if one intermediate station were nonoperational, but bypassing both nonoperational pump stations. Similar procedures would be followed for each of the remaining sections of the system.

1.1.3 TWO NONOPERATIONAL ADJACENT PUMP STATIONS

In case two adjacent pump stations were nonoperational, the pipeline would be shut down because of insufficient pressure to pump even at a reduced flow. Upstream from the nonoperational pair of stations, all pump stations would stop the flow. If, however, sections of the line could be flushed, that would be done. Downstream from the nonoperational pair of pump stations, the pipeline would immediately be switched to water and would continue to operate until the slurry in each section of the line between pump stations is displaced by the water, at which time the upstream station would be shut down. This procedure would be followed sequentially until either the slurry in the whole line is displaced or the nonoperational stations were operational and normal or reduced-flow operation could resume. Similar procedures would be followed for each of the remaining sections of the system.

1.I.4 PUMP LOSS

Pump stations would be designed to operate at 106 percent normal flow with one pump in standby condition. A mainline pump station could continue to operate at near-normal flow with two nonoperational pumps (the spare plus another). A mainline pump station could operate at a reduced flow with three nonoperational pumps (the spare plus two others), in which case the flow in the rest of the pipeline would be reduced as necessary to match the capacity of the partially operational station.

A mainline pump station would be shut down and bypassed in the case of four nonoperational pumps. The pipeline would then continue to operate at reduced flow or would be shut down, as described above.

1.I.5 NONOPERATIONAL PREPARATION PLANT

Each of the three coal slurry preparation plants would have three or more processing lines. The main and gathering slurry pipelines would continue to operate with the loss of one or more processing lines or an entire preparation plant until all the available slurry in agitated storage had been exhausted. The pump station would then pump water through the line until the slurry passed the next pump station. This process would continue down the entire line. The pump stations would be sequentially shut down until the preparation plant could resume operation and slurry pumping could be started.

1.I.6 NONOPERATIONAL DEWATERING PLANT

Slurry would be sent to storage ponds when a dewatering plant is nonoperational. The slurry would later be reclaimed, using mechanical or hydraulic systems for processing through the dewatering plant when it resumes operation.

1.I.7 NONSPECIFICATION SLURRY HANDLING

Emergency slurry storage ponds would be provided at the main-line pump station located at Jacobs Ranch and at main-line P-2. All emergency slurry storage ponds would be lined to prevent leakage of slurry water into the subsurface strata. The ponds would have enough capacity for the entire volume of slurry in the upstream section of the pipeline.

Slurry removal would be initiated by the control room operator when instrument readings indicate a substantial batch of nonspecification slurry in the pipeline. The main line would continue to operate during slurry evacuation at Jacobs Ranch resulting from deliveries of nonspecification slurry from North Rawhide or North Antelope. The procedures to be used would be the same as those used for the loss of a preparation plant. When slurry is removed at P-2, the pump station would immediately switch to pumping water until either specification slurry is received or the entire downstream section of the line is displaced with water and the pump stations are sequentially shut down.

The emergency nonspecification slurry handling is an extreme situation and may only be required a few times during the life of the project.

1.J DESIGN, CONSTRUCTION, AND OPERATING FEATURES FOR PREVENTING AND MINIMIZING COAL SLURRY SPILLS

Given the broad scope of available data and the difficulty in assigning causes of spills to various pipeline designs, sizes, and operating parameters, it would be misleading to assign definite probabilities of occurrence to any of the listed causes for a specific pipeline. However, several pertinent assumptions could be made. Those causes that are related to quality of material are likely to continue to decrease as more technical advances are made and as older lines are replaced by new ones. Considerable research has gone into the development stage. Welding and testing procedures have improved significantly. Welds on high-pressure systems are X-rayed as required by pipeline codes to ensure a high-quality weld, and pipelines are hydrostatically tested to at least 1.25 times the design operating pressures.

Operator error was the common denominator in most of the known slurry pipeline leakages. This cause should diminish as routine procedures become established and learned, and the frequency of such occurrences should decline and the repair time should be decreased.

Many features of design, construction, and operation of the proposed pipeline would prevent or reduce the likelihood of a spill. Others would minimize or contain coal which could possibly be released. Some of these features have been incorporated specifically for spill prevention or control, while others provide spill prevention in addition to their main function. The following discussion summarizes these features for the proposed slurry pipeline system. A spill contingency plan for the pipeline would be prepared and approved prior to initiating pipeline operations.

1.J.1 PUMP STATIONS

Pump stations along the pipeline would be fenced and lighted. Pressure alarms would be placed on pumping units, which would be monitored in the supervisory control center. A valve interlock system would assure proper operation of valves. Pump station valves would be remotely operated from the operations control center, and regular maintenance and inspection personnel would check potential leak sources, test equipment, and replace inoperative parts as necessary.

Design and fabrication of materials for the pump stations would be in accordance with the applicable codes and standards for the pipeline facility.

1.J.2 PIPELINE

Pipeline welds would be X-rayed according to Department of Transportation requirements. The pipeline would be hydrostatically pressure-tested at each point to at least 125 percent of the internal design pressure. The pipeline would be cathodically protected for its entire length, significantly reducing the likelihood of corrosion.

The main-line valves at pump stations and some river crossings would be located along the pipeline route, capable of significantly reducing potential drainage from the pipeline. These valves would be regularly checked for operation. Other features include:

- Pipeline route markers which would be placed at road crossings, water crossings, property boundaries, and other pipeline crossings
- Aerial markers, which would be placed on fence lines in cultivated areas and at intervals of 5 to 10 miles in open lands
- Contacts would be established and maintained with police and fire departments and with people in the vicinity of the pipeline route; this program would include persons to be contacted if unusual activity is observed
- Contacts with other pipeline operators so that notification is given if work is to be conducted close to the proposed pipeline

Design and fabrication would be in accordance with applicable codes, standards, and regulations. These currently are as follows:

- American National Standards Institute, American National Standard Code for Pressure Piping, Liquid Petroleum Transportation Piping Systems (ANSI B31.4)
- U.S. Department of Transportation, Office of Pipeline Safety, Title 49, Chapter 1, Subchapter B, Part 195; Transportation of Liquids by Pipeline
- American Petroleum Institute, Specification for Pipeline Valves

1.J.3 SLURRY STORAGE TANKS

Slurry storage tanks would be designed in accordance with all applicable codes, standards, and regulations. Tanks would be hydrostatically tested before being placed in service and would be equipped with tank guaging alarm systems to prevent overfilling. Overflow piping would also be provided to channel overspills into a sump recovery system.

1.J.4 MAINTENANCE, INSPECTION, AND MONITORING

The maintenance and inspection program would include frequent inspection of potential leak sources, as well as periodic testing and replacement of equipment.

1.J.5 IDENTIFICATION OF POTENTIAL SPILLS

Potential pipeline drainage calculations would be made when the final designs were completed.

Five primary means of detecting or identifying slurry spills would be incorporated into the design and operation of the proposed pipeline:

- Aerial reconnaissance
- Ground patrols
- Third-party reports
- Coal slurry metering systems
- Pipeline drainage

Each of these detection methods is discussed below, based on the pipeline operating and design parameters at this time.

Aerial Reconnaissance

Low-level aerial reconnaissance would be regularly conducted along the pipeline route as a part of normal pipeline operation. This reconnaissance would determine any activities along the route that might present a problem to pipeline operations, such as excavation by a third party, washouts, erosion, landslides, or slumping. Aerial reconnaissance reported by other pipeline operations in or near the proposed slurry pipeline would also be used to identify any activity that may affect slurry pipeline operations. Aerial reconnaissance would also be used to supplement ground patrols in checking for potential leaks indicated by the pipeline monitoring system.

Ground Patrols

Designated teams would patrol the pipeline route during regularly scheduled maintenance and inspection. Sensitive areas along the pipeline route, such as major and scenic stream crossings, very populous areas, and environmentally sensitive areas, would be patrolled frequently.

The maintenance bases, which would support pipeline operations, would direct normal ground reconnaissance and provide response for potential pipeline leaks, described in the spill contingency plan for the pipeline.

Third-Party Reports

Persons with activities along or near the pipeline route would be requested to report coal found on the ground or in the water along the pipeline route. These persons would also be requested to report activities or conditions in the vicinity of the pipeline that may possibly cause a spill.

Coal Slurry Metering Systems

Depending upon their role in pipeline integrity and operation, selected pump stations would have a capability to monitor various pipeline measurements that would indicate a leak. This monitoring system would be able to detect a leak and locate it between two consecutive metering stations. Three systems would be used to monitor the movement of coal slurry in the pipeline: flow rate metering, volume balance monitoring, and hydraulic gradient analysis. These systems would be monitored continuously in the operations control center. If a leak were indicated, the pipeline operator would be able to react quickly and initiate the proper operational and spill contingency plan actions. Each of these systems is discussed below, followed by a discussion of their combined use to detect leaks.

Flow Rate Metering (Station to Station). Stations possessing a flow rate metering capability would be able to monitor the pipeline continually and could detect potential losses with a minimum threshold of between 1 and 1.5 percent of throughput. This would be accomplished by installing a metering system that would constantly monitor the volume and flow rate of coal slurry passing through the station and then relay the readings to the master control station. Operations control would transmit readings from each metering station into a master computer, which would compare current readings with previous readings and correlate them with readings from other metering stations.

Volume Balance Monitoring (Total Mass Balance). Flow rate meters would regularly be simultaneously calibrated to ensure that the same amount of coal slurry entering the pipeline is being received at the pipeline terminals. This system would be capable of detecting losses in excess of 1.5 percent.

Hydraulic Gradient Analysis. This system incorporates pipeline pressure and temperature monitoring systems which would be combined to analyze the hydraulic gradient along the pipeline route. This system would be able to detect losses of 10 percent or more.

It should be noted that the detection capability would improve with operating experience, making it possible to identify smaller losses, since at this point the system is not in operation and is still theoretical. These three systems would be used together to provide detection of potential leaks.

The amount of coal slurry lost from a pipeline leak would depend upon the following factors: throughput rate, detection and verification time, pipeline pressure at the leak point, pipeline shutdown time, hole size, and pipeline drainage. A general discussion of potential spill volumes and the factors that would affect this volume follows. This discussion includes the placement of valves along the pipeline that would be effective in limiting pipeline drainage and thus the total spill volume.

Operational actions to be initiated by the dispatcher would depend upon size and/or duration of the monitored decrease in throughput. A small decrease (1 to 1.5 percent) would be monitored for an additional period of time after discovery to see if the system returned to a steady state or if the decrease remained constant. It should be emphasized that metering systems could record variances, in the range of 1 to 1.5 percent and below, which are not leaks. Such a small variance in throughput might require some time to verify as a leak. In this case, the maintenance base nearest the affected portion of pipeline would be alerted and would immediately initiate an aerial and/or ground reconnaissance of the pipeline to verify the leak. If the variance were due to a leak, only a small amount of coal slurry would be lost during this time.

It is likely that a small decrease in throughput would be due to circumstances other than a leak. A very slight change in input at the initial pump station would be periodically reflected in the computer scanning system as the decreased volume reached each downstream metering station. Trouble would be indicated if stations upstream from a given point began to record an increased throughput and stations downstream from the same point began to show a decrease.

If the recorded decrease reached a steady state, or increased to its previous reading, and if it were recorded at all metering stations, it is likely that the decrease would be the result of either a slight change in input at the initial stations or a change in the operating temperature. If the decrease were monitored at only one metering station with no decrease monitored at downstream metering stations, it would indicate that the meters at the station recording the decrease were malfunctioning. However, if the decrease in throughput continued to drop off, and if it were more prominent at one metering station with smaller decreases being recorded at downstream metering stations, it would be likely that the decrease would indicate a leak. If the output from the central computer recorded a decrease less than 1 to 1.5 percent of throughput, the pipeline dispatcher would attempt to verify the loss before initiating changes in pipeline operations.

Recorded losses in excess of 1.5 percent would be treated differently by the pipeline dispatcher. Verification time would be considerably less for larger decreases in throughput. Not only would the metering stations record decreases in volume, but drops in pressure would also occur and pumps and pump station valves would automatically shut down. A leak that was discharging more than 1.5 percent of throughput would be noticeable within minutes of occurrence, and the spill contingency plan could be initiated immediately. The loss rate would vary with hole size and the operating pressure of the pipeline.

Pipeline Drainage

Drainage characteristics of a slurry pipeline are an important factor in determining the total volume of a pipeline spill. Coal slurry would begin to drain from the pipeline to equalize pressures in the ruptured pipeline section after shutdown. The coal solids would also begin to settle in the pipeline, and the concentration of coal in the spill would decrease with time. As coal settles into pipeline valleys and as the pipe drains, sections of the pipeline may close off and not permit further flow.

1.K INTERRELATIONSHIP OF PROPOSED ACTION WITH OTHER PLANNED PROJECTS

Projects that are in the planning stages in Converse and Campbell counties, Wyoming, were examined to determine which ones were likely to occur by 1990. Table 1-21 provides a listing of all projects that are most likely to occur.

The projects listed would be drawing from the same work force, creating an increase in the socioeconomic impacts because of the simultaneous timing. There would probably be an increase in imported personnel.

TABLE 1-21

PLANNED PROJECTS IN CONVERSE AND CAMPBELL COUNTIES THAT ARE MOST LIKELY TO OCCUR

Project	Company
Coal Mines	
Buckskin	Shell
Rojo Caballos	Mobil
Pronghorn	Consolidated Coal
North Antelope	Peabody Coal
Antelope	Nerco
South Rawhide	Carter Mining
Uranium Operations	
Reno Creek	Rocky Mountain Energy
Pintee	Thunderbird Joint Venture
American Nuclear Mine and Mill	American Nuclear
Kerr-McGee Mine and Mill	Kerr-McGee
Power Plants	
Wyodak II	Pacific Power & Light; Black Hills Power & Light
Madison Water	
Gillette Municipal Water Supply	City of Gillette

CHAPTER 2
MARKET ALTERNATIVE

2.A GENERAL DESCRIPTION

The market alternative would be very similar to the proposed action but would serve two markets (Oologah and Baton Rouge) not served by the proposed action (Map 1-1). In addition, the market alternative would not serve the Ponca City and Muskogee markets. These changes in markets result in some changes to individual preparation plant throughputs (although the total output of 37.4 MMTA remains the same), main slurry pipeline routes, and dewatering plant locations. The most significant change is in the main slurry pipeline route between Wyoming and Oklahoma as a result of the location of the first delivery terminal at Oologah for the market alternative, compared with Ponca City for the proposed action (Map 1-1). Table 2-1 shows the system components and coal delivery schedule for nine terminals. Each receiving terminal would include a dewatering plant for separating the coal from the transport water. Strip maps showing the system are provided in Appendix A of the EIS.

The operation of such a system—including (1) start-up, (2) steady-state flow, (3) shutdown, and (4) restart after shutdown—would be the same as described for the proposed action (see Section 1.H).

2.B WATER REQUIREMENTS

The water requirements for the market alternative would be the same as those discussed for the proposed action, with the exception of minor differences in pump station water requirements, as shown in Table 2-2.

TABLE 2-1

PROPOSED COAL DELIVERY SCHEDULE: MARKET ALTERNATIVE

PREPARATION PLANT	MINE	DELIVERY TERMINAL	As Mined Coal (MMTA)				
			1985	1986	1987	1988	1989
North Rawhide	North Rawhide	Pryor, OK	2.75	5.3	5.3	5.3	5.3
	Buckskin	New Roads, LA	2.0	2.0	2.0	2.0	2.0
	North Rawhide	Baton Rouge, LA	--	5.8	5.8	5.8	5.8
		Subtotal	4.75	13.1	13.1	13.1	13.1
Jacobs Ranch	Jacobs Ranch	Oolagah, OK	3.5	3.5	3.5	3.5	3.5
	Jacobs Ranch	White Bluff, AR	5.0	5.0	5.0	5.0	5.0
	Jacobs Ranch	Boyce, LA	1.8	1.8	1.8	1.8	1.8
	Jacobs Ranch	Lake Charles, LA	4.0	4.0	4.0	4.0	4.0
		Subtotal	14.3	14.3	14.3	14.3	14.3
North Antelope	North Antelope	Independence, AR	5.0	5.0	5.0	5.0	5.0
	Antelope	Wilton, LA	--	--	2.5	2.5	5.0
		Subtotal	5.0	5.0	7.5	7.5	10.0
		TOTAL	24.0	32.4	34.9	34.9	37.4

TABLE 2-2

MAIN SLURRY PIPELINE PUMP STATION WATER REQUIREMENTS: MARKET ALTERNATIVE

State	Total Water Requirements (acre-feet/year)	Number of Main Slurry Pipeline Pump Stations
Wyoming	60	2*
Nebraska	40	1
Kansas	120	3
Oklahoma	50	2
Arkansas	0	5
Louisiana	0	6
Total	270	19

*Three slurry pump stations (NR, NA, and PMBC-1) in Wyoming were not included in this table because they would obtain makeup water from the Madison Formation (Niobrara well field) instead of from individual wells.

2.C ACREAGE REQUIREMENTS AND LAND STATUS

The complete market alternative coal slurry transportation project would involve 1,785 miles of right-of-way for water and coal slurry pipelines. During construction of this alternative, approximately 22,199 acres would be disturbed. Of this amount, approximately one percent is federally controlled. Table 2-3 shows the land status for this alternative. All of the approximately 21,256 right-of-way acres would be reclaimed following construction and returned to their preconstruction use wherever possible.

2.D GENERAL CONSTRUCTION, OPERATING, AND RECLAMATION PROCEDURES

These general procedures would be similar to the procedures described for the proposed action (see Section 1.D). See Section 1.G for detailed procedures regarding specific facilities.

2.E TIME FRAME

The time frame would be the same as that discussed for the proposed action (see Section 1.E for details). Figures 2-1 and 2-2 present construction schedules for the pipeline pump stations, and for the preparation and dewatering plants.

2.F WORK FORCE

Tables 2-4, 2-5, and 2-6 show the work force required for construction of the project. See Section I.F for the typical construction manpower for a mainline pump station, a typical dewatering plant, and river crossings. Table 2-7 lists operating personnel. The maintenance base personnel summary is provided in Table 2-8.

TABLE 2-3

LAND STATUS AND ACREAGE: MARKET ALTERNATIVE

State	Pipeline Segment	Total Miles	Right-of-Way										Surface Facilities[d] All Private Acres	Total Acres
			Private		Federal				State		Indian			
					Forest Service		BLM							
			Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]		
Wyoming														
	N.R.-J.R. (slurry & water)	55	46	558	4	48	1	12	4	48	-	-	85	751
	N.A.-J.R. (slurry & water)	16	6	73	9	109	-	-	1	12	-	-	65	259
	J.R.-WY/NE Border (slurry)	102	82	994	14	170	2	24	4	48	-	-	150	1,386
	Niobrara Well Field	62[b]	62	376	-	-	-	-	-	-	-	-	125	501
	Niobrara-J.R. (water)	68	28	340	-	-	3	18	-	-	-	-	3	379
	Subtotal	266	224	2,341	27	327	6	54	9	108	-	-	428	3,276
Nebraska														
	WY/NE Border-NE/KS Border	275	258	3,127	-	-	-	-	17	206	-	-	25	3,358
	Subtotal	275	258	3,127	-	-	-	-	17	206	-	-	25	3,358
Kansas														
	NE/KS Border-KS/OK Border	325	313	3,794	-	-	-	-	12	145	-	-	75	4,014
	Subtotal	325	313	3,794	-	-	-	-	12	145	-	-	75	4,014
Oklahoma														
	KS/OK Border-Oologah	54	118	1,430	-	-	-	-	16	194	18	218	10	1,852
	Oologah-Pryor	30	-	-	-	-	-	-	-	-	-	-	35	35
	Pryor-OK/ARK Border	68	-	-	-	-	-	-	-	-	-	-	25	25
	Subtotal	152	118	1,430	-	-	-	-	16	194	18	218	70	1,912
Arkansas														
	OK/ARK Border-Atkins Junc.	94	93	1,127	-	-	-	-	1	12	-	-	25	1,164
	Atkins Junc.-Independence	93	92	1,115	-	-	-	-	1	12	-	-	60	1,187
	Atkins Junc.-White Bluff	80	79	957	-	-	-	-	1	12	-	-	10	979
	White Bluff-ARK/LA Border	102	99	1,200	-	-	-	-	3	36	-	-	50	1,286
	Subtotal	369	363	4,399	-	-	-	-	6	72	-	-	145	4,616

TABLE 2-3 Concluded

State	Pipeline Segment	Total Miles	Right-of-Way										Surface Facilities[d] All Private Acres	Total Acres
			Private		Federal				State		Indian			
					Forest Service		BLM							
			Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]		
Louisiana														
	ARK/LA Border-Alex. Junc.	136	134	1,624	-	-	-	-	2	24	-	-	50	1,698
	Alexandria Junc.-Boyce	24	23	279	-	-	-	-	1	12	-	-	35	326
	Alex. Junc.-Lake Charles	89	87	1,054	-	-	-	-	2	24	-	-	35	1,113
	Alex. Junc.-New Roads	76	74	897	-	-	-	-	2	24	-	-	10	931
	New Roads-Baton Rouge	25[c]	7	85	-	-	-	-	-	-	-	-	35	120
	New Roads-Wilton	66	65	788	-	-	-	-	1	12	-	-	35	835
	Subtotal	398	390	4,727	-	-	-	-	8	96	-	-	200	5,023
	Total	1785	1666	19,818	27	327	6	54	68	821	18	218	943	22,199

Note: All numbers are rounded to nearest whole number.

[a] Construction acreage shown; acreage is based on a 100-foot-right-of-way for private, federal, state, and Indian lands. Water gathering lines within Niobrara well field require a 50-foot wide construction right-of-way.

[b] Main water and water distribution lines are adjacent to slurry lines except for about 31 miles of total.

[c] All but about 7 miles are in common right-of-way.

[d] Transmission lines and microwave towers not included due to insignificant amount of acreage required.

Legend

N.R. - North Rawhide
J.R. - Jacobs Ranch
N.A. - North Antelope
NE - Nebraska
KS - Kansas

OK - Oklahoma
ARK - Arkansas
LA - Louisiana
ALEX. - Alexandria
WY - Wyoming

FIGURE 2-1.

ASSUMED PIPELINE AND PUMP STATION CONSTRUCTION SCHEDULE: MARKET ALTERNATIVE

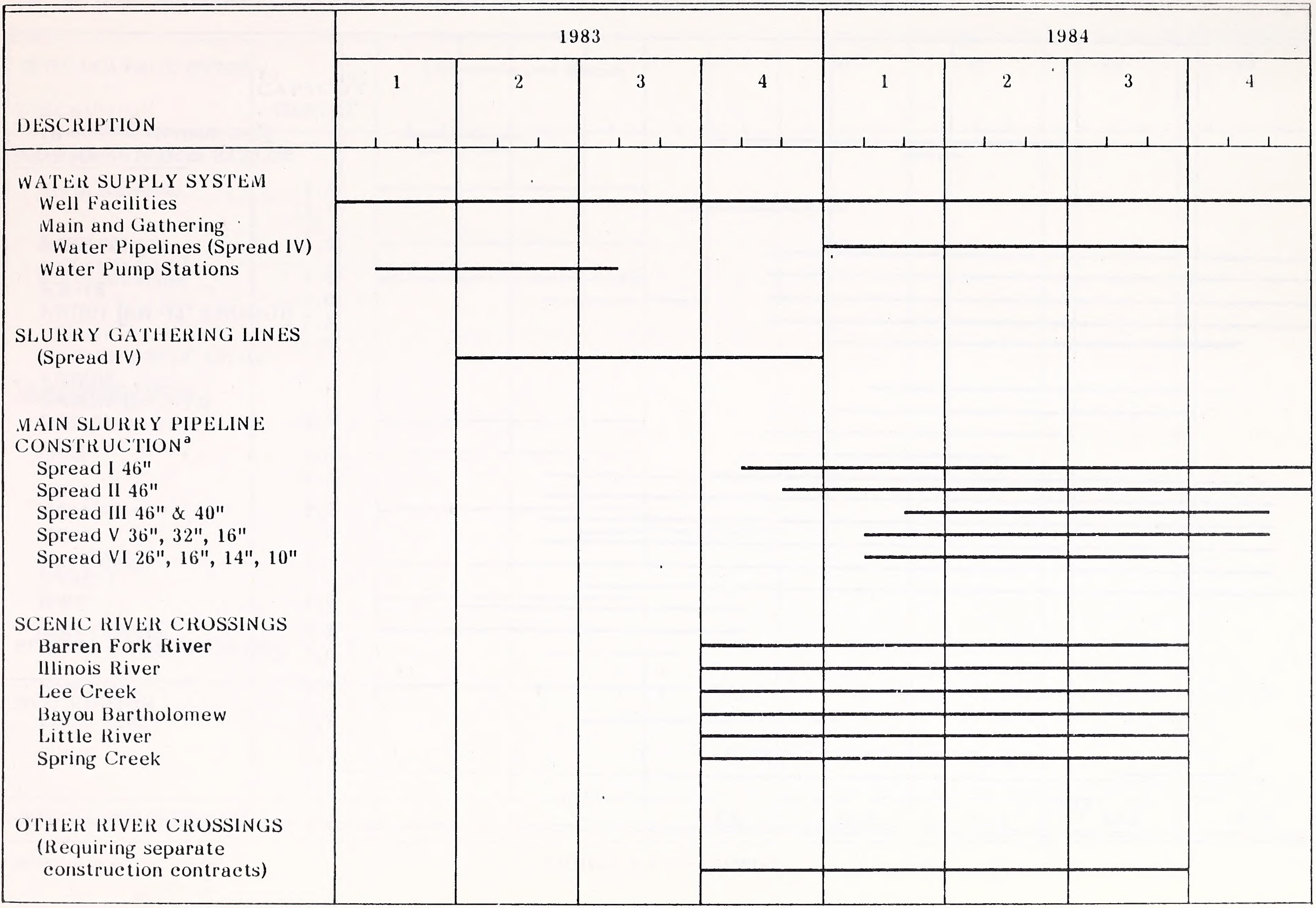
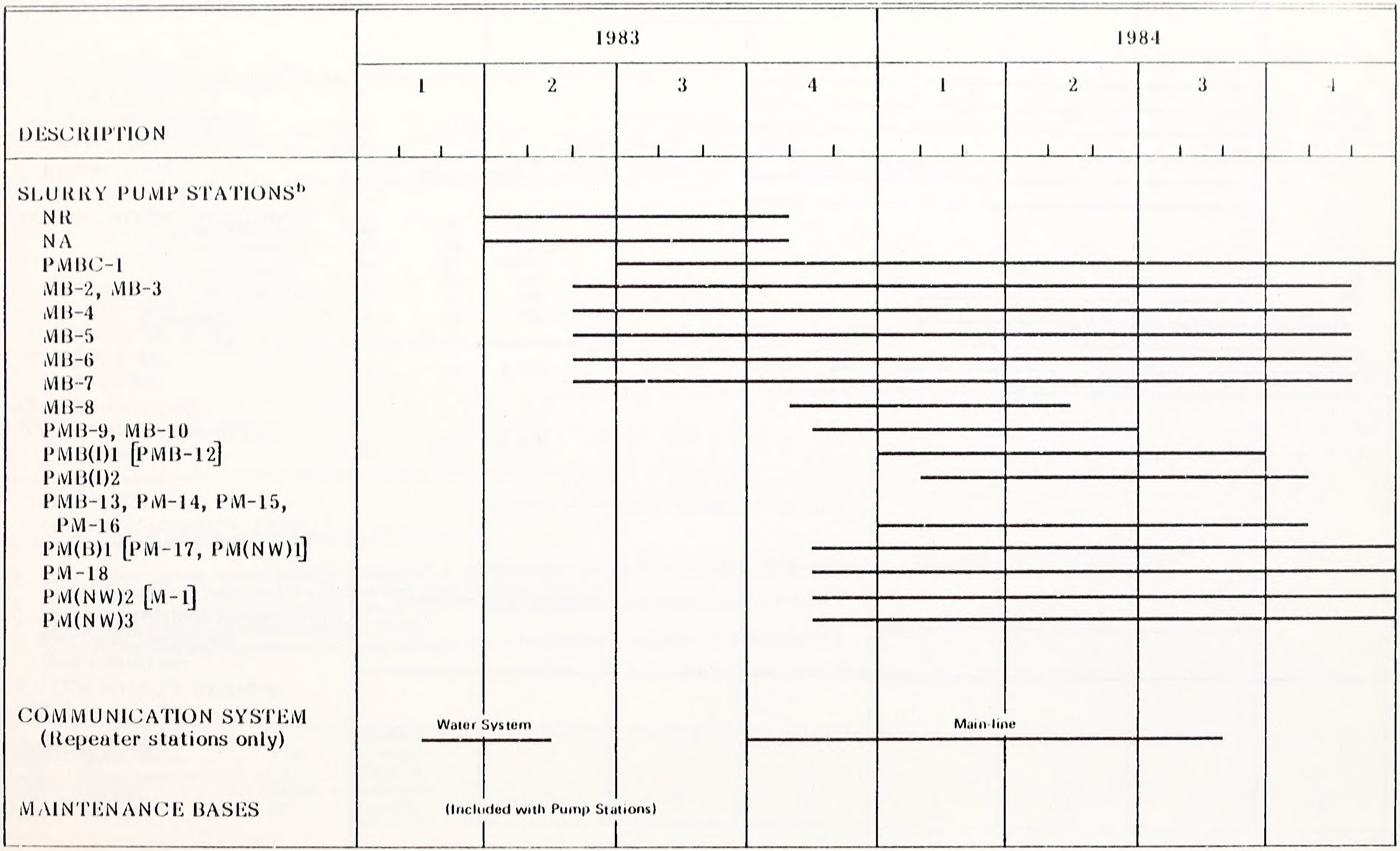


FIGURE 2-1. (concluded)



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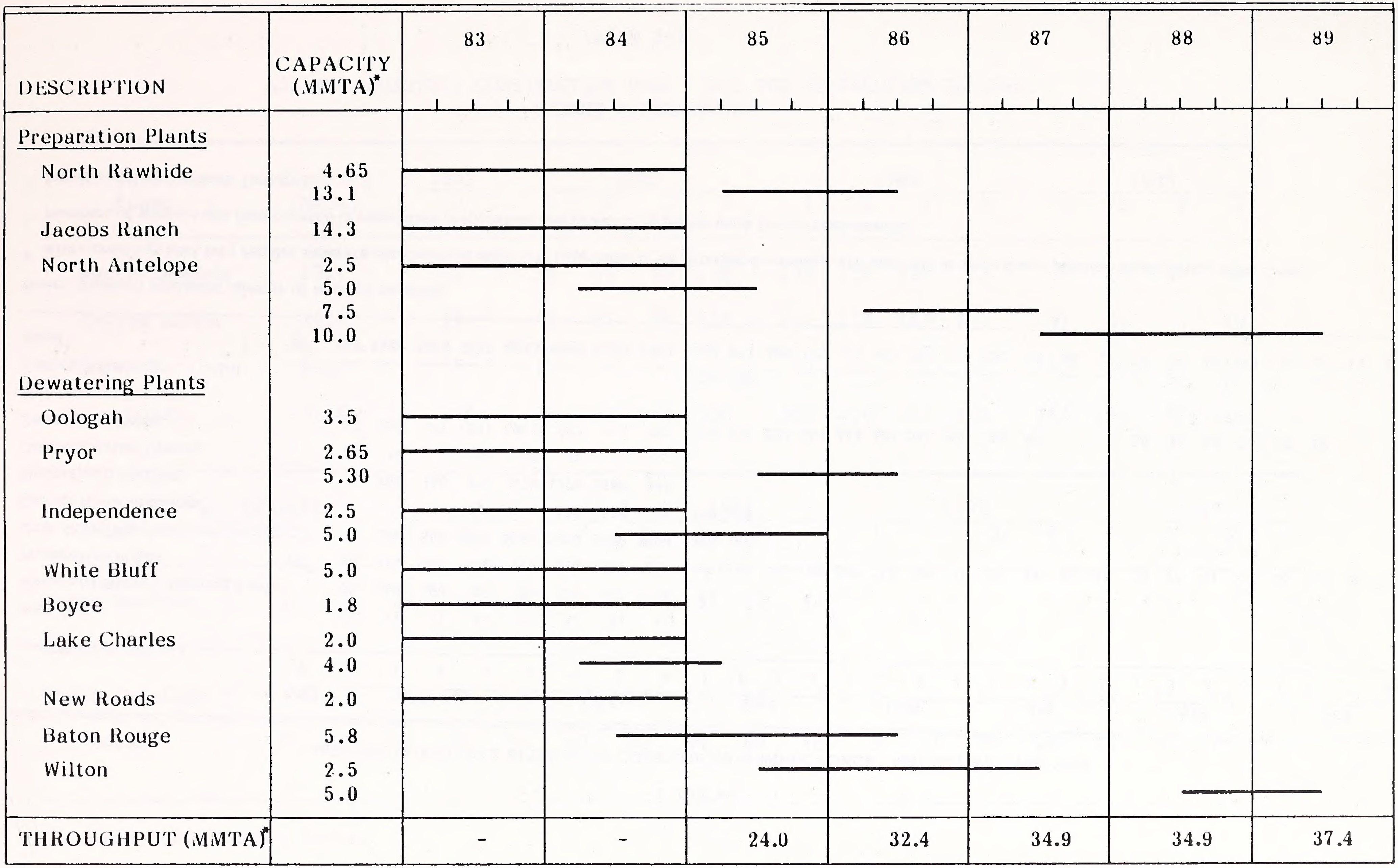
[a] See Table 2-6 for spread locations.

[b] See strip maps in Appendix A for description of symbols and locations of pump stations. There are only 22 different slurry pump station locations, pump station shown in brackets is at same location as first pump station listed in the row.

FIGURE 2-2.

ASSUMED PREPARATION AND DEWATERING PLANTS CONSTRUCTION SCHEDULE: MARKET ALTERNATIVE



* Millions of (short) tons annually

TABLE 2-4

ASSUMED QUARTERLY BUILDUP OF CONSTRUCTION WORK FORCE: MARKET ALTERNATIVE

	1982	1983				1984				1985				1986				1987				1988				1989			
	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Well Field		41	41	41	41	41	41	41	41																				
Water and Slurry Gathering Lines		60	360	360	60	90	260	260	30	15																			
Preparation Plants	29[e]	96	145	205	300	380	414	387	325	165	154	72	126	105	53	56	67	62	34	40	19	5	11	21	49	56	25	18	5
Main Slurry PipelineConstruction			100	500	2950	2950	2950	2950	2950	300	100																		
Special River Crossings[a]							150	150	150	150	150																		
Slurry Pump Stations			265	685	975	1870	1970	1680	945																				
Communication System		20	20		20	20	20																						
Dewatering Plants		52	295	587	1031	1202	1063	815	435	154	207	224	353	413	402	310	203	93	43			20	45	65	70	60	40		
Maintenance Bases[b]																													
Testing & Startup										260	260																		
Total	29[c]	269	1226	2379	5377	6553	6868	6283	4876	1044	871	296	479	518	455	366	270	155	77	40	19	25	56	86	119	116	65	18	5

Note: Numbers represent number of workers required.

[a] River crossings that may require separate construction contracts (Appendix D-6). Standard crossings are included in main slurry pipeline construction work force.

[b] Numbers of workers are incorporated in respective preparation and dewatering plants work force requirements.

[c] Initial mobilization work force.

TABLE 2-5

ASSUMED QUARTERLY CONSTRUCTION WORK FORCE FOR PREPARATION PLANTS: MARKET ALTERNATIVE

Preparation Plant	Capacity (MMTA)	1982	1983				1984				1985			
		4	1	2	3	4	1	2	3	4	1	2	3	4
North Rawhide	13.1	9	36	55	80	120	139	154	134	73	8	19	44	95
Jacobs Ranch	14.3	15	45	61	86	125	171	178	183	202	97	85	3	19
North Antelope	10.0	5	15	29	40	55	70	82	70	50	60	50	25	12
Total	37.4	29[a]	96	145	206	300	380	414	387	325	165	154	72	126

Preparation Plant	Capacity (MMTA)	1986				1987				1988				1989			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
North Rawhide	13.1	82	35	35	18	6	9	22	14								
Jacobs Ranch	14.3	9															
North Antelope	10.0	14	18	21	49	56	25	18	5	5	11	21	49	56	25	18	5
Total	37.4	105	53	56	67	62	34	40	19	5	11	21	49	56	25	18	5

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[a] Initial mobilization force.

TABLE 2-6

PIPELINE SPREAD CONSTRUCTION RESPONSIBILITIES: MARKET ALTERNATIVE

Pipeline Spread	Pipeline Segment	Miles	Pipeline Outside Diameter (inches)	Manpower Requirement	
				Typical*	Add for Rough Terrain
I	Jacobs Ranch to Milepost MB-12	390	46	670	78
II	Milepost MB-12 to Pryor (MP MB-408)	396	46	670	78
III	Pryor to Atkins Junction	162	40	616	78
IV	Jacobs Ranch to N. Antelope (water)	16	12	260	--
	N. Antelope to Jacobs Ranch (slurry)	16	24	360	--
	Jacobs Ranch to N. Rawhide (water)	55	18	260	--
	N. Rawhide to Jacobs Ranch (slurry)	55	32	360	--
	Jacobs Ranch to Well Field (water)	68	26	260	--
V	Atkins Junction to White Bluff	80	36	550	65
	White Bluff to Alexandria Junction	238	32	550	65
	Atkins Junction to Independence	93	16	260	--
VI	Alexandria Junction to New Roads	76	26	390	--
	New Roads to Wilton	66	16	260	--
	Alexandria Junction to Boyce	25	10	260	--
	Alexandria Junction to Lake Charles	89	14	260	--
	New Roads to Baton Rouge	26	18	260	--

Note: Spread I would proceed from south to north; Spread IV would proceed as shown above; the remaining spreads would proceed from north to south.

*Numbers shown represent maximum number of workers per pipeline spread.

TABLE 2-7

SUMMARY OF OPERATING PERSONNEL: MARKET ALTERNATIVE

Location	Admin. & Support	Supervision	Engrs. & Draftsmen	Techs. & Operators	Secs. & Clerks	Craftsmen & Laborers	Total
Headquarters	6	4	6	19	6	-	41
Subtotal	6	4	6	19	6	0	41
Western District (Jacobs Ranch)							
Administration	4	-	-	-	-	-	4
Water Supply	-	1	-	10	-	-	11
Prep. Plants	-	41	-	80	7	68	196
Pipelines	-	-	-	6	-	3	9
Maintenance Base	-	1	-	7	-	15	23
Subtotal	4	43	0	103	7	86	243
Central District (Pryor)							
Administration	3	-	-	-	-	-	3
Dewatering Plant	-	11	-	13	5	28	57
Pipeline	-	-	-	8	-	16	24
Maintenance Base	-	1	-	15	-	17	33
Subtotal	3	12	0	36	5	61	117
Eastern District (White Bluff)							
Administration	3	-	-	-	-	-	3
Dewatering Plants	-	15	-	16	7	35	73
Pipeline	-	-	-	12	-	6	18
Maintenance Base	-	4	-	7	-	36	47
Subtotal	3	19	0	35	7	77	141
Southern District (New Roads)							
Administration	3	-	-	-	-	-	3
Dewatering Plants	-	27	-	31	13	66	137
Pipeline	-	-	-	9	-	16	24
Maintenance Base	-	4	-	7	-	36	47
Subtotal	3	31	0	47	13	118	211
Total	19	109	6	240	38	342	753

TABLE 2-8

SUMMARY OF MAINTENANCE BASE PERSONNEL: MARKET ALTERNATIVE

	Western District (Jacobs Ranch)	Central District (Pryor)	Eastern District (White Bluff)	Southern District (New Roads)
Supervisor	1	1	1	1
Shop Foreman			3	3
Repairmen/Welder			4	4
Machinist			4	4
Millwright			13	13
Senior Electrical Technician	1	1	1	1
Senior Instrumentation Technician	1	1	1	1
Senior Communications Technician	1	1	1	1
Communications Technician		3		
Computer Control Technician		3		
Electrical/Instrumentation Technician	3	4	3	3
Senior Mechanical Repairman	1	1	1	1
Repairman/Welder	4	4	4	4
Equipment Operator	1	2	1	1
Pipeliner	10	12	10	10
Total	23	33	47	47

2.G PROJECT COMPONENTS

The project components would be generally the same as those discussed for the proposed action. Only the differences in siting, dimensions, construction techniques, and work force are described below. Because construction and operation of the water supply system and dewatering plants would be the same as those discussed for the proposed action, they are not discussed again here.

2.G.1 COAL SLURRY PREPARATION PLANTS

The coal slurry preparation plants would be the same as those described for the proposed action except for the capacity of the facilities. The North Rawhide plant would have a capacity of 13.1 MMTA; the Jacobs Ranch plant would have a capacity of 14.3 MMTA, and the North Antelope plant would have a capacity of 10.0 MMTA. The schedules for capacity buildup and the expansion of delivery capability at the plants are shown in Table 2-9. Figure 2-3 provides a system mass balance for this alternative. See Section 1.G.1 for a detailed description of the plants. Acreage requirements for these plants would be 85, 100, and 65, respectively. Typical layouts of the preparation plants would be the same as those shown for the proposed action (Figures 1-6 and 1-7).

2.G.2 WATER SUPPLY SYSTEM

The water supply system would be the same as that described for the proposed action. See Section 1.G.2 for details.

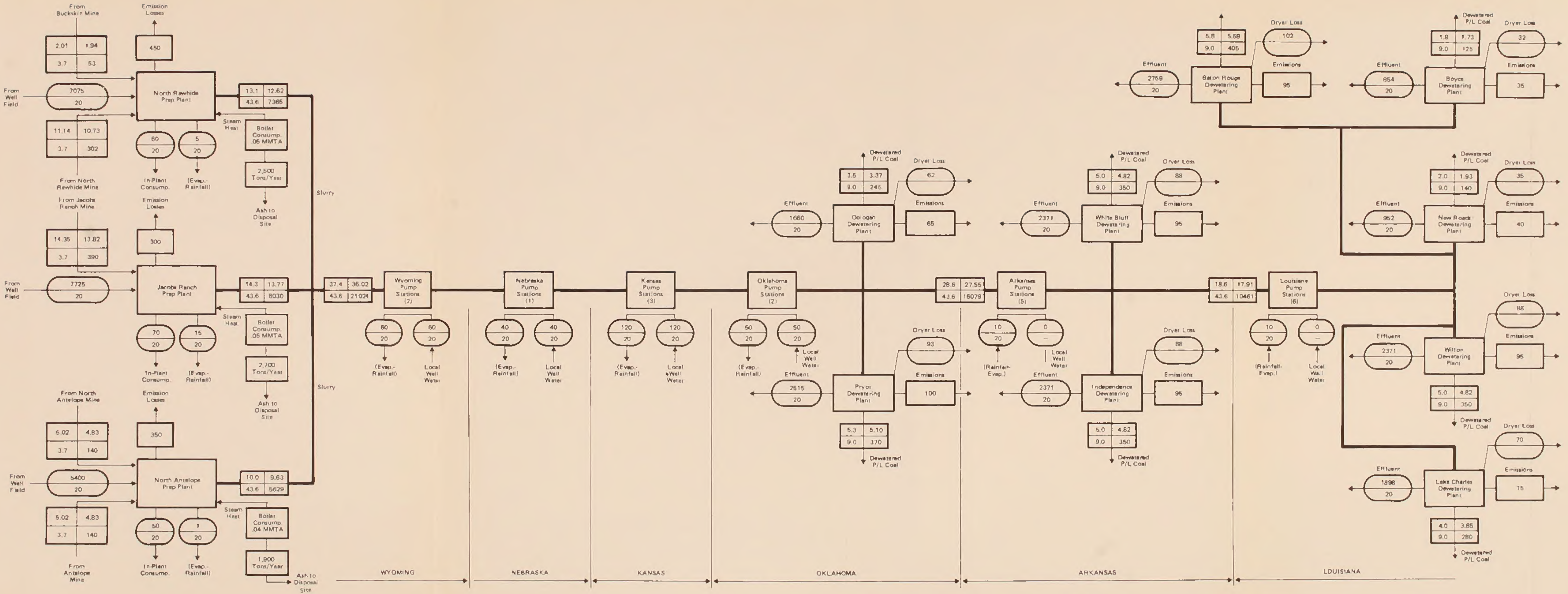
2.G.3 COAL SLURRY PIPELINES AND PUMP STATIONS

The coal slurry pipelines and pump stations as described for the proposed action would be applicable to this alternative market configuration. (See Section 1.G.3 for details of the pipeline system.) Some aspects of the system described would differ for this alternative market configuration. The different aspects of the market alternative are described below.

TABLE 2-9

PROPOSED COAL DELIVERY SCHEDULE: MARKET ALTERNATIVE

Delivery Terminal	As Mined Coal (MMTA)				
	1985	1986	1987	1988	1989
Oologah, OK	3.5	3.5	3.5	3.5	3.5
Pryor, OK	2.7	5.3	5.3	5.3	5.3
Independence, AR	5.0	5.0	5.0	5.0	5.0
White Bluff, AR	5.0	5.0	5.0	5.0	5.0
Boyce, LA	1.8	1.8	1.8	1.8	1.8
Lake Charles, LA	4.0	4.0	4.0	4.0	4.0
New Roads, LA	2.0	2.0	2.0	2.0	2.0
Baton Rouge, LA	--	5.8	5.8	5.8	5.8
Wilton, LA	--	--	2.5	2.5	5.0
TOTAL	24.0	32.4	34.9	34.9	37.4



NOTES:

1. Assume as-mined surface moisture ≈ 3.7%.
2. Assume slurry @ 56.4% surface dry solids, which corresponds to 41.7% bone dry solids.
3. Assume dewatered P/L coal @ 9% surface moisture.
4. Evaporation and precipitation values taken from water atlas of the U.S.
5. Water exported from Wyoming (21,024 ac-ft/yr) includes 20,000 ac-ft/yr from well field and 1,024 ac-ft/yr from surface moisture of as-mined coal.
6. Coal-water balance based on 37.4 MMTA throughout.

LEGEND

Coal:

As-mined Coal (MMTA)	Surface Dry Coal (MMTA)
Surface Moisture (%)	Surface Moisture (Acre-Ft/Yr)

Water: Water (Acre-Ft./Year) / TSS (ppm)

Emissions: Total Emissions (Tons/Yr)

Figure 2-3. SYSTEM MASS BALANCE: MARKET ALTERNATIVE

The main slurry pipeline would extend approximately 1639 miles (18 miles of which are in common right-of-way) from the Jacobs Ranch plant to proposed terminals in Oklahoma, Arkansas, and Louisiana. Pipeline distances from the mine sites to each of the proposed delivery terminals are shown in Table 2-10.

Data on pipeline diameters and lengths and number of pump stations for this alternative market configuration are shown in Tables 2-11 and 2-12. The change in pipe diameter from section to section reflects the projected reduced throughput as slurry is delivered to intermediate customers.

A coal delivery schedule for a typical case is given in Table 2-9 to indicate the delivery buildup requirements.

Construction

Coal Slurry Pipelines. Construction of the market alternative main slurry pipeline and slurry gathering lines would disturb approximately 20,507 acres of land.

The construction techniques, equipment, and impacts would be similar to those for the proposed action (Section 1.G.3).

This alternative market configuration would cross 54 rivers requiring special permits (Table 2-13).

The principal communities near the likely pipeline construction headquarters are listed in Table 2-14.

Pump Stations. Construction of the 22 slurry pump stations (3 of which are located within the preparation plant boundaries) would disturb approximately 475 acres of land. The construction techniques, plot plan, and facilities would be the same as those described for the proposed action (Section 1.G.3). Communities near the proposed pump station sites are listed in Table 2-15.

TABLE 2-10

PIPELINE DISTANCES FROM MINE SITES TO DELIVERY TERMINALS: MARKET ALTERNATIVE

Delivery Terminal	Mine Location	Distance From Origin (miles)
Oologah	Jacobs Ranch	756
Pryor	North Rawhide	840
Independence	North Antelope	1057
White Bluff	Jacobs Ranch	1028
Boyce	Jacobs Ranch	1289
Lake Charles	Jacobs Ranch	1354
New Roads	Buckskin	1395
Baton Rouge	North Rawhide	1421
Wilton	Antelope	1461

Note: Mileage numbers are rounded to nearest whole number.

TABLE 2-11

COAL SLURRY PIPELINE DIMENSIONS: MARKET ALTERNATIVE

Pipeline Segment	Length (miles)	Pipe O.D. (inches)
North Rawhide to Jacobs Ranch	55	32
North Antelope to Jacobs Ranch	16	24
Jacobs Ranch to Oologah	756	46
Oologah to Pryor	30	46
Pryor to Atkins Junction	162	40
Atkins Junction to Independence	93	16
Atkins Junction to White Bluff	80	36
White Bluff to Alexandria Junction	237	32
Alexandria Junction to New Roads	76	26
Alexandria Junction to Boyce	24	10
Alexandria Junction to Lake Charles	89	14
New Roads to Baton Rouge	26	18
New Roads to Wilton	66	16

Note: Numbers are rounded to nearest whole number.

TABLE 2-12

COAL SLURRY PIPELINE PUMP STATIONS: MARKET ALTERNATIVE

State	County/ Parish	Pipeline Segment	Milepost	Station Location	Pump Station Designation
Wyoming	Campbell	N. Rawhide to Jacobs Ranch	NR-0	North Rawhide	NR[A]
Wyoming	Campbell	N. Antelope to Jacobs Ranch	NA-0	North Antelope	NA[B]
Wyoming	Campbell	Jacobs Ranch to Oologah	PMBC-0	Jacobs Ranch	PMBC-1[C]
Wyoming	Niobara	Jacobs Ranch to Oologah	PMB-60	-	MB-2
Wyoming	Niobara	Jacobs Ranch to Oologah	PMB-98	-	MB-3
Nebraska	Garden	Jacobs Ranch to Oologah	PMB-247	-	MB-4
Kansas	Decatur	Jacobs Ranch to Oologah	MB-30	-	MB-5
Kansas	Ellsworth	Jacobs Ranch to Oologah	MB-172	-	MB-6
Kansas	Butler	Jacobs Ranch to Oologah	MB-252	-	MB-7
Oklahoma	Rogers	Oclogah to Pryor	MB-378	Oologaah	MB-8
Oklahoma	Mayes	Pryor to Atkins Junction	MB-497.5	Pryor	PMB-9
Arkansas	Crawford	Pryor to Atkins Junction	MB-48.25	-	MB-10
Arkansas	Pope	Atkins Junc. to Independence	PMB(I)-0	Atkins Junc.	PMB(I)-1[D]
Arkansas	Pope	Atkins Junc. to White Bluff	PMB-947.5	Atkins Junc.	PMB-12[D]
Arkansas	Van Buren	Atkins Junc. to Independence	PMB(I)-39.0	-	PMB(I)-2
Arkansas	Jefferson	White Bluff to Alex. Jn.	PMB-1077.6	White Bluf	PMB-13
Arkansas	Bradley	White Bluff to Alex. Jn.	PM-1137.6	-	PM-14
Louisiana	Ouachita	White Bluff to Alex. Jn.	PM-1203.6	-	PM-15
Louisiana	La Salle	White Bluff to Alex. Jn.	PM-1257.6	-	PM-16
Louisiana	Rapidec	Alex. Junc. to Boyce	PM(B)-0	Alex. Junc.	PM(B)-1[E]
Louisiana	Rapides	Alex. Junc. to Lake Charles	PM-1315	Alex. Junc.	PM-17[E]
Louisiana	Rapides	Alex. Junc. to New Roads	PM(NW)-0	Alex. Junc.	PM(NW)-1[E]
Louisiana	Allen	Alex. Junc. to Lake Charles	PM-1360	-	PM-18
Louisiana	Pointe-Coupee	New Roads to Wilton	PM(NW)-75.6	New Roads	PM(NW)-2[F]
Louisiana	Pointe-Coupee	New Roads to Baton Rouge	M-0	New Roads	M-1[F]
Louisiana	St. Landry	New Roads to Wilton	PM(NW)-108	-	PM(NW)-3

Milepost and pump station designations are explained in Appendix A of the EIS.

[A] Pump station NR is located within the boundries of the North Rawhide preparation plant.

[B] Pump station NA is located within the boundaries of the North Antelope preparation plant.

[C] Pump station PMBC-1 is located within the boundaries of the Jacobs Ranch preparation plant.

[D] Pump stations PMB(I)-1 and PMB-12 are located together at the same pump station location.

[E] Pump stations PM(B)-1, PM-17, and PM (NW)-1 are located together at the same pump station location.

[F] Pump stations PM(NW)-2 and M-1 are located together at the same pump station location.

TABLE 2-13

RIVER AND STREAM CROSSINGS REQUIRING SPECIAL PERMITS: MARKET ALTERNATIVE

	Name	Type Permit	State
1.	North Platte River	404	Nebraska
2.	South Platte River	404	Nebraska
3.	Republican River	404	Nebraska
4.	Saline River	404	Kansas
5.	Verdigris River	404	Oklahoma
6.	Neosho (Grand) River	404	Oklahoma
7.	Baron Fork River[a]	404	Oklahoma
8.	Illinois River[a]	10	Oklahoma
9.	Lee Creek	10	Arkansas
10.	Frog Bayou	404	Arkansas
11.	Little Mulberry	404	Arkansas
12.	Mulberry River	10	Arkansas
13.	White Oak Creek	404	Arkansas
14.	Spadra	404	Arkansas
15.	Little Piney	404	Arkansas
16.	East Fork Horsehead Creek	404	Arkansas
17.	Horsehead Creek	404	Arkansas
18.	Gum Log Creek	404	Arkansas
19.	Piney Creek	404	Arkansas
20.	Illinois Bayou	404	Arkansas
21.	Point Remove Creek (2)	10	Arkansas
22.	Arkansas River	10	Arkansas
23.	West Fork Point Remove Creek	404	Arkansas
24.	East Fork Point Remove Creek	404	Arkansas
25.	North Fork Cadron Creek	404	Arkansas
26.	Greers Ferry Lake	10	Arkansas
27.	Little Red River	404	Arkansas
28.	Big Creek	404	Arkansas

TABLE 2-13 Concluded

Name	Type Permit	State
29. White River (Newport terminal)	10	Arkansas
30. Cypress Creek	404	Arkansas
31. Fourche La Fave River	10	Arkansas
32. Harris Brake Lake	404	Arkansas
33. Big Maumelle River	404	Arkansas
34. Fourche Creek	404	Arkansas
35. Saline River	10	Arkansas
36. Saline River	10	Arkansas
37. Bayou Bartholomew[a]	10	Louisiana
38. Ouachita River	10	Louisiana
39. Little River[a]	10	Louisiana
40. Red River	10	Louisiana
41. Bayou Boeuf	10	Louisiana
42. Bayou Boeuf & Cocodrie Diversion Channel	10	Louisiana
43. Spring Creek[a]	10	Louisiana
44. Bayou Cocodrie	10	Louisiana
45. Calcasieu River	10	Louisiana
INDEPENDENCE LATERAL		
46. White River	10	Arkansas
NEW ROADS LATERAL		
47. Bayou des Glaises Diversion Channel	404	Louisiana
48. Atchafalaya River	10	Louisiana
49. Bayou Fordoche	404	Louisiana
BATON ROUGE LATERAL		
50. Mississippi River	10	Louisiana
WILTON EXTENSION		
51. Gulf Intercoastal Waterway-Port Allen Canal	10	Louisiana
52. Bayou Plaquemine	10	Louisiana
53. Bayou Lafourche	10	Louisiana
54. Mississippi River	10	Louisiana

[a] Scenic river.

TABLE 2-14

COMMUNITIES NEAR LIKELY PIPELINE CONSTRUCTION SPREAD HEADQUARTERS: MARKET ALTERNATIVE

Community	County/Parish	State
Gillette	Campbell	Wyoming
Wright	Campbell	Wyoming
Lusk	Niobrara	Wyoming
Scottsbluff	Scotts Bluff	Nebraska
Ogallala	Keith	Nebraska
McCook	Red Willow	Nebraska
Russell	Russell	Kansas
Wichita	Sedgwick	Kansas
Bartlesville	Washington	Oklahoma
Fort Smith	Sebastian	Arkansas
Russellville	Pope	Arkansas
Batesville	Independence	Arkansas
Pine Bluff	Jefferson	Arkansas
Monroe	Oachita	Louisiana
Alexandria	Rapides	Louisiana
Lake Charles	Calcasieu	Louisiana
Baton Rouge	E. Baton Rouge	Louisiana

TABLE 2-15

COMMUNITIES NEAR PROPOSED PUMP STATION SITES: MARKET ALTERNATIVE

Pump Station	Community	County/Parish	State
NR	Gillette	Campbell	Wyoming
NA	Wright	Campbell	Wyoming
N-1	Lusk	Niobrara	Wyoming
PMBC-1	Wright	Campbell	Wyoming
MB-2	Lusk	Niobrara	Wyoming
MB-3	Lusk	Niobrara	Wyoming
MB-4	Ogallala	Keith	Nebraska
MB-5	Norton	Norton	Kansas
MB-6	Elsworth	Elsworth	Kansas
MB-7	Wichita	Sedgwick	Kansas
MB-8	Oologah	Rogers	Oklahoma
PMB-9	Pryor	Sebastian	Oklahoma
MB-10	Fort Smith	Sebastian	Arkansas
PMB-12[a]	Atkins	Pope	Arkansas
PMB-13	Pine Bluff	Jefferson	Arkansas
PM-14	Warren	Bradley	Arkansas
PM-15	Monroe	Ouachita	Louisiana
PM-16	Olla	La Salle	Louisiana
PM-17[b]	Alexandria	Rapides	Louisiana
PM-18	Oberlin	Allen	Louisiana
M-1[c]	New Roads	Pointe Coupee	Louisiana
PM(NW)-3	Plaquemine	Iberville	Louisiana

[a] Pump station PMB(I)-1 is at the same location as this pump station.

[b] Pump stations PM(B)-1 and PM(NW)-1 are at the same location as this pump station.

[c] Pump station PM(NW)-2 is at the same location as this pump station.

Operation, Maintenance, and Abandonment

Acreage. During project operation, the market alternative coal slurry pipelines and pump stations would require about 20,982 acres of land. Of this total, approximately 475 acres would be required for the 22 pump stations. Each 25-acre plot would be fenced.

Work Force. The work force would be the same as that for the proposed action.

Maintenance. Maintenance of this alternative system would be the same as that for the proposed action. See Section 1.G.3 for details.

Noise. Noise levels would be similar to those for the proposed action. See Section 1.G.3 for details.

2.G.4 DEWATERING PLANTS

The construction, operation, maintenance, and abandonment procedures for the dewatering plants would be the same as those described for the proposed action. See Section 1.G.4 for a description of the facilities, construction methods, and operation and maintenance methods.

2.G.5 ANCILLARY FACILITIES

The ancillary facilities would be the same as those described for the proposed action, except for sources of electric power (Table 2-16). See Section 1.G.5 for details on the other ancillary facilities.

2.H SYSTEM NONROUTINE OPERATIONS

Several nonroutine operating cases, which would be the same for this alternative market configuration, are described in Section 1.I.

TABLE 2-16

POWER REQUIREMENTS AND SOURCE IDENTIFICATION: MARKET ALTERNATIVE

Facility	Kilowatt Demand	Source	Transmission Line (Miles)
Water-Well Field	9,500	115 kV - Niobrara Electric Association, Inc.	30
Pump Station N-1 (water)	11,300	69 kV - Niobrara Electric Association, Inc.	Tap
N. Rawhide Prep. Plant	21,000	69 kV - Tri-County Electric Assoc., Inc.	12
Pump Station N-2 (water)	300	69 kV - Tri-County Electric Assoc., Inc.	Tap
N. Rawhide Pump Stn.	7,200	69 kV - Tri-County Electric Assoc., Inc.	12
N. Antelope Prep. Plant	16,000	69 kV - Tri-County Electric Assoc., Inc.	Tap
Pump Station N-3 (water)	500	69 kV - Tri-County Electric Assoc., Inc.	Tap
N. Antelope Pump Stn.	1,500	69 kV - Tri-County Electric Assoc., Inc.	Tap
Jacobs Ranch Prep. Plant	22,900	69 kV - Tri-County Electric Assoc., Inc.	Tap
Pump Station PMBC-1	10,300	69 kV - Tri-County Electric Assoc., Inc.	Tap
Pump Station MB-2	9,600	69 kV - Niobrara Electric Assoc., Inc.	15
Pump Station MB-3	9,600	69 kV - Niobrara Electric Assoc., Inc.	38
Pump Station MB-4	9,600	34.5 kV - Wheat Belt Public Power District	9
Pump Station MB-5	9,600	115 kV - McCook Public Power District	2
Pump Station MB-6	9,600	115 kV - Norton/Decatur Electric Cooperative	2

TABLE 2-16 continued

Facility	Kilowatt Demand	Source	Transmission Line (Miles)
Pump Station MB-7	9,600	69 kV - Butler Rural Electric Cooperative, Inc.	4
Oologah Dewatering Plant	6,000	Public Service Company of Oklahoma	Tap
Pump Station MB-8	9,600	Public Service Company of Oklahoma	Tap
Pryor Dewatering Plant	7,200	Grand River Dam Authority	Tap
Pump Station PMB-9	9,600	Grand River Dam Authority	Tap
Pump Station MB-10	9,600	69 kV - Cookson Hills Cooperative, Inc.	4
Pump Stations PMB(I)-1, and PMB-12	11,100	161 kV - Arkansas Power & Light Co.	Tap
Pump Station PMB(I)-2	3,100	161 kV - Arkansas Power & Light Co.	4
Independence Dewatering Plant	8,000	Arkansas Power & Light Co.	Tap
White Bluff Dewatering Plant	8,000	Arkansas Power & Light Co.	Tap
Pump Station PMB-13	10,600	Arkansas Power & Light Co.	Tap
Pump Station PM-14	6,100	115 kV - Arkansas Power & Light Co.	2
Pump Station PM-15	6,100	115 kV - Louisiana Power & Light	6
Pump Station PM-16	6,100	34.5 kV - Louisiana Power & Light	5
Pump Stations PM(B)-1, PM-17, and PM(NW)-1	8,600	115 kV - Central Louisiana Electric Co.	2

TABLE 2-16 concluded

Facility	Kilowatt Demand	Source	Transmission Line (Miles)
Boyce Dewatering Plant	3,800	Central Louisiana Electric Co.	Tap
Pump Station PM-18	3,100	34.5 kV - Central Louisiana Electric Co.	2
Lake Charles Dewatering Plant	7,000	Gulf States Utilities Co.	Tap
New Roads Dewatering Plant	4,000	Cajun Electric Co.	Tap
Pump Stations PM(NW)-2, and M-1	7,300	Cajun Electric Co.	Tap
Baton Rouge Dewatering Plant	7,500	Gulf States Utilities Co.	Tap
Pump Station PM(NW)-3	2,500	69 kV - Gulf States Utilities Co.	Tap
Wilton Dewatering Plant	7,500	Louisiana Power & Light Co.	Tap

Note: Tap includes $\leq$ 1 mile of new transmission line.

2.I INTERRELATIONSHIP OF THE MARKET ALTERNATIVE WITH OTHER PLANNED PROJECTS

The interrelationship of the market alternative with other planned projects would be the same as that described for the proposed action (Section 1.K).

CHAPTER 3

CYPRESS BEND PIPELINE-BARGE ALTERNATIVE

3.A GENERAL DESCRIPTION

The Cypress Bend pipeline-barge alternative would transport coal slurry along the same route as the market alternative to White Bluff, Arkansas. Coal slurry would be delivered along the route at Oologah, Pryor, Independence, and White Bluff. From White Bluff, a pipeline would be constructed to a dewatering and barge loading facility at Cypress Bend, Arkansas on the Mississippi River (Map 1-1). Delivery points by barge include New Roads, Baton Rouge, and Wilton, Louisiana.

The pipeline-barge alternative would consist of five major operating facilities: (1) coal slurry preparation plants, (2) main and reserve water supply and delivery systems, (3) coal slurry pipeline system, (4) coal slurry dewatering plants, and (5) barge loading facility. Facilities numbered (1) through (4) are the same as described in the proposed action except for location and/or size. A conceptual layout of the barge loading facility is shown on Figure 3-1.

The coal slurry would be transported through approximately 71 miles of gathering pipelines to the main slurry pipeline, which would extend approximately 1202 miles through Wyoming, Nebraska, and Kansas to receiving terminals in Oklahoma and Arkansas for a maximum of seven power plants. Table 3-1 shows the coal delivery schedule for the terminals. Each receiving terminal would include a dewatering plant for separating the coal from the transport water. Strip maps showing the system are provided in Appendix A of the EIS.

The operation of such a system—including (1) start-up, (2) steady-state flow, (3) shutdown, and (4) restart after shutdown—would be the same as described for the proposed action (see Section 1.H).

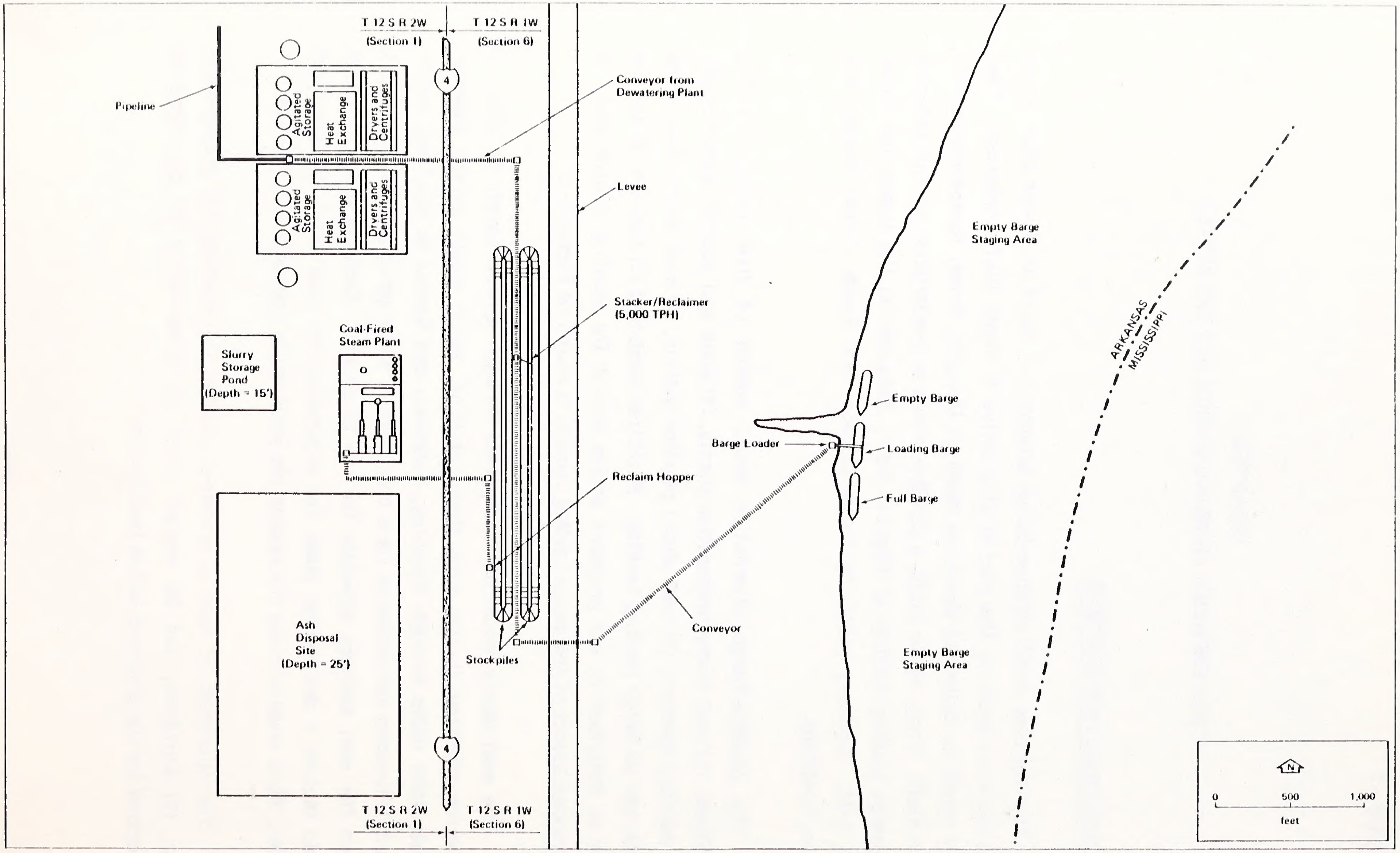


Figure 3-1. CYPRESS BEND BARGE FACILITY

TABLE 3-1

PROPOSED COAL DELIVERY SCHEDULE: CYPRESS BEND PIPELINE-BARGE ALTERNATIVE

Delivery Terminal	As-Mined Coal (MMTA)				
	1985	1986	1987	1988	1989
Oologah, OK[a]	3.5	3.5	3.5	3.5	3.5
Pryor, OK[a]	2.65	5.3	5.3	5.3	5.3
Independence, AR[a]	5.0	5.0	5.0	5.0	5.0
White Bluff, AR[a]	5.0	5.0	5.0	5.0	5.0
New Roads, LA[b]	2.0	2.0	2.0	2.0	2.0
Baton Rouge, LA[b]	--	5.8	5.8	11.3	11.3
Wilton, LA[b]	--	--	2.5	2.5	5.0
Cypress Bend, AR[c]	0.3	0.3	0.3	0.3	0.3
Total	18.45	26.9	29.4	34.9	37.4

[a] Delivery by pipeline.

[b] Transportation by pipeline to Cypress Bend, then delivery by barge.

[c] To be used at dewatering plant.

3.B WATER REQUIREMENTS

The main slurry pipeline pump station water requirements for the Cypress Bend pipeline-barge alternative would be the same as those discussed for the market alternative, as shown below:

	Water Requirements (acre-feet/year)	Number of Slurry Pipeline Pump Stations
Wyoming	60	2*
Nebraska	40	1
Kansas	120	3
Oklahoma	50	2
Arkansas	0	4
	270	12

3.C ACREAGE REQUIREMENTS AND LAND STATUS

The complete Cypress Bend pipeline-barge alternative coal slurry transportation project would involve 1,366 miles of right-of-way for water and coal slurry pipelines. During construction of this alternative, approximately 17,097 acres would be disturbed. Of this amount, approximately 1 percent is federally controlled. Table 3-2 shows the land status for this alternative. All of the approximately 16,179 right-of-way acres would be reclaimed and returned to their preconstruction use wherever possible.

3.D GENERAL CONSTRUCTION, OPERATING, AND RECLAMATION PROCEDURES

These general procedures would be the same as those described for the proposed action (see Section 1.D). See Section 1.G for detailed procedures regarding specific facilities.

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* Three slurry pump stations (NR, NA, and PMBC-1) in Wyoming were not included because they would obtain makeup water from the Madison Formation (Niobrara well field) instead of from individual wells.

TABLE 3-2

LAND STATUS AND ACREAGE: CYPRESS BEND PIPELINE-BARGE ALTERNATIVE

State	Pipeline Segment	Total Miles	Right-of-Way										Surface Facilities[c] All Private Acres	Total Acres
			Private		Federal				State		Indian			
					Forest Service		BLM							
			Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]		
Wyoming														
	N.R.-J.R. (slurry & water)	55	46	558	4	48	1	12	4	48	-	-	110	776
	N.A.-J.R. (slurry & water)	16	6	73	9	109	-	-	1	12	-	-	65	259
	J.R.-WY/NE Border (slurry)	102	82	994	14	170	2	24	4	48	-	-	120	1,356
	Niobrara Well Field	62	62	376	-	-	-	-	-	-	-	-	125	501
	Niobrara-J.R. (water)	68[b]	28	340	-	-	3	18	-	-	-	-	3	379
	Subtotal	266	224	2,341	27	327	6	54	9	108	-	-	423	3,271
Nebraska														
	WY/NE Border-NE/KS Border	275	258	3,127	-	-	-	-	17	206	-	-	25	3,358
	Subtotal	275	258	3,127	-	-	-	-	17	206	-	-	25	3,358
Kansas														
	NE/KS Border-KS/OK Border	325	313	3,794	-	-	-	-	12	145	-	-	75	4,014
	Subtotal	325	313	3,794	-	-	-	-	12	145	-	-	75	4,014
Oklahoma														
	KS/OK Border-Oologah	54	118	1,430	-	-	-	-	16	194	18	218	10	1,852
	Oologah-Pryor	30	-	-	-	-	-	-	-	-	-	-	35	35
	Pryor-OK/ARK Border	68	-	-	-	-	-	-	-	-	-	-	25	25
	Subtotal	152	118	1,430	-	-	-	-	16	194	18	218	70	1,912
Arkansas														
	OK/ARK Border-Atkins Junc.	94	93	1,127	-	-	-	-	1	12	-	-	25	1,164
	Atkins Junc.-Independence	93	92	1,115	-	-	-	-	1	12	-	-	60	1,187
	Atkins Junc.-White Bluff	80	79	957	-	-	-	-	1	12	-	-	10	979
	White Bluff-Cypress Bend	81	80	970	-	-	-	-	1	12	-	-	230	1,212
	Subtotal	348	344	4,169	-	-	-	-	4	48	-	-	325	4,542
	Total	1,366	1,257	14,861	27	327	6	54	58	701	18	218	918	17,097

Note: All numbers are rounded to nearest whole number.

[a] Construction acreage shown; acreage is based on a 100-foot right-of-way for private, federal, state, and Indian lands. Water gathering lines within Niobrara well field require a 50-foot wide construction right-of-way.

[b] Main water and water distribution lines are adjacent to slurry lines except for about 31 miles of total.

[c] Transmission lines and microwave towers not included due to insignificant amount of acreage required.

Legend

N.R.	North Rawhide	KS	Kansas
J.R.	Jacobs Ranch	OK	Oklahoma
N.A.	North Antelope	ARK	Arkansas
NE	Nebraska	WY	Wyoming

3.E TIME FRAME

The time frame would be the same as that discussed for the proposed action. See Section 1.E for details. Figures 3-2a and 3-3b present construction schedules for the pipeline, pump stations, and for the preparation and dewatering plants.

3.F WORK FORCE

Tables 3-3, 3-4, and 3-5 show the work force that would be required for construction of this alternative. See Section 1.F for data on the construction work force needed to build a main-line pump station, a typical dewatering plant, and river crossings. Table 3-6 lists operating personnel, and Table 3-7 lists the maintenance base personnel summary.

3.G PROJECT COMPONENTS

The Cypress Bend pipeline-barge alternative would have the same components as the proposed action, with the addition of the facilities at the barge sites. Barge unloading facilities owned by the coal customers would be used, so they are not considered part of this alternative. The water supply system would be the same as described for the proposed action in Section 1.G.2, so it is not discussed here. In general, the design, construction, operation, and maintenance of the preparation plants, coal slurry pipelines and pump stations, and dewatering plants would also be the same as described for the proposed action. However, specific capacities, dimensions, and similar details would be different. These are described below. Figure 3-3 provides a mass balance for this alternative.

3.G.1 COAL SLURRY PREPARATION PLANTS

The coal slurry preparation plants are described in Section 1.G.1. The capacities of the preparation plants would be different for this alternative. The

FIGURE 3-2a

ASSUMED PIPELINE AND PUMP STATION CONSTRUCTION SCHEDULE:
CYPRESS BEND PIPELINE-BARGE ALTERNATIVE

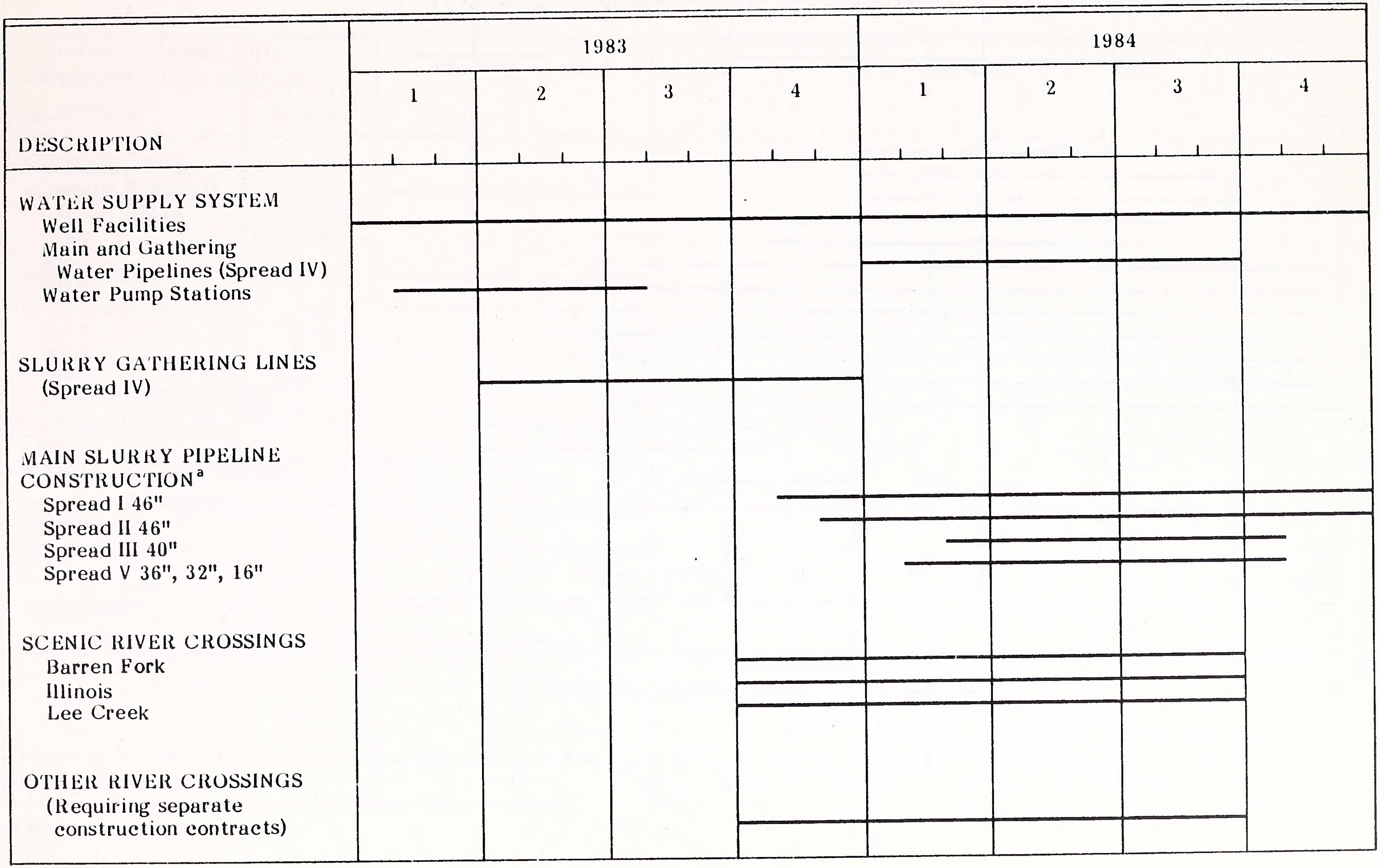
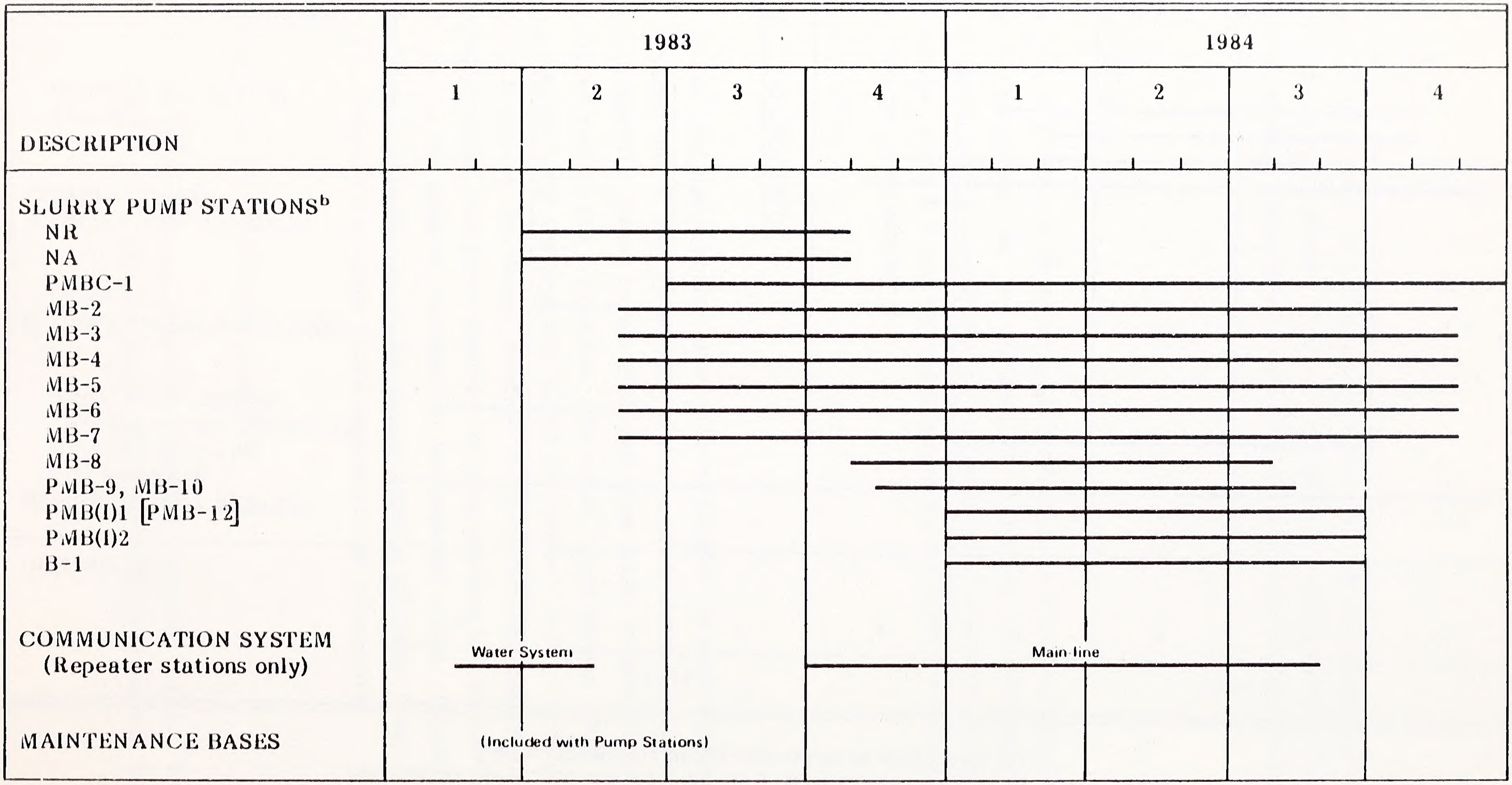


FIGURE 3-2a (concluded)



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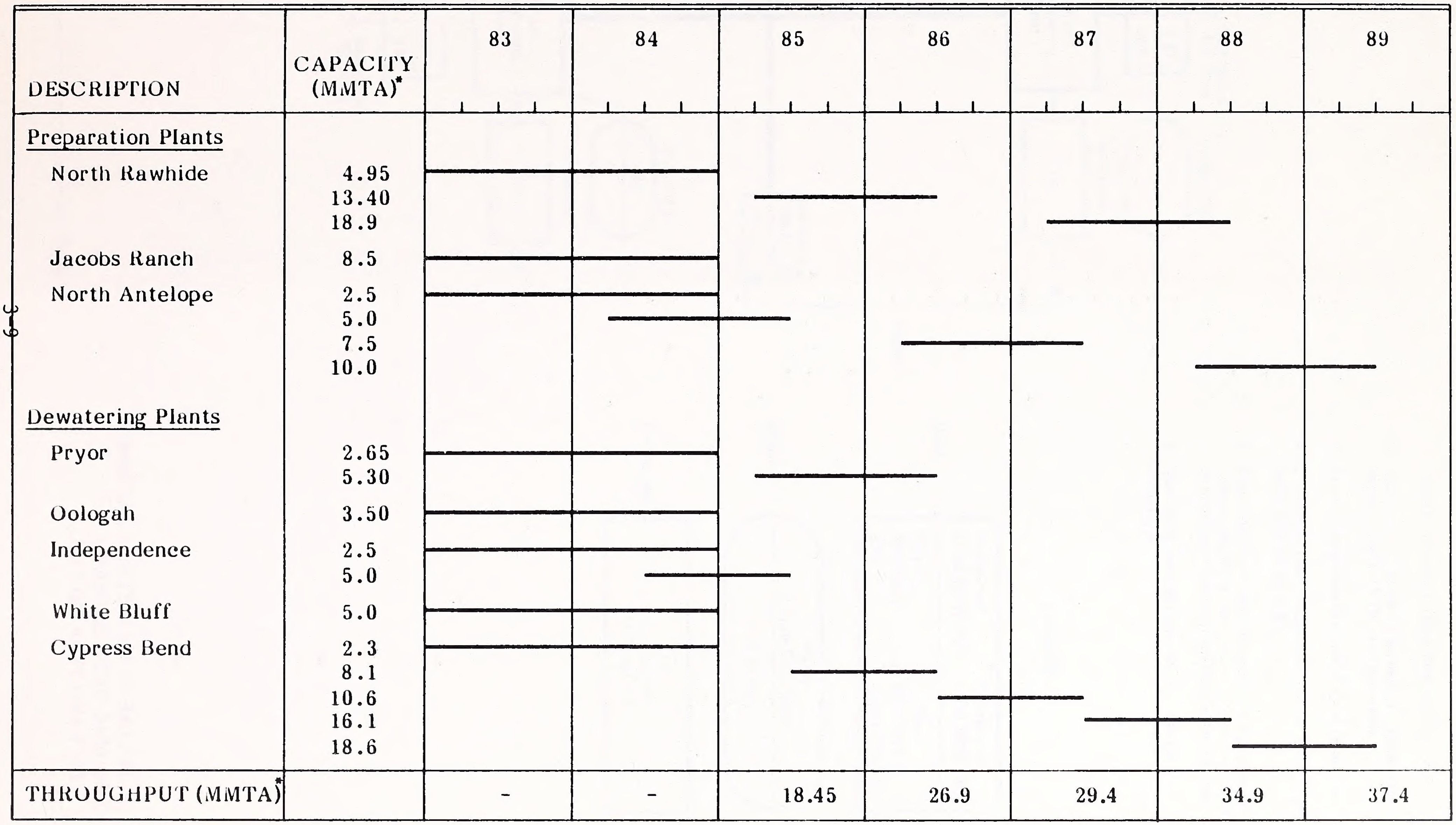
[a] See Table 3-5 for spread locations.

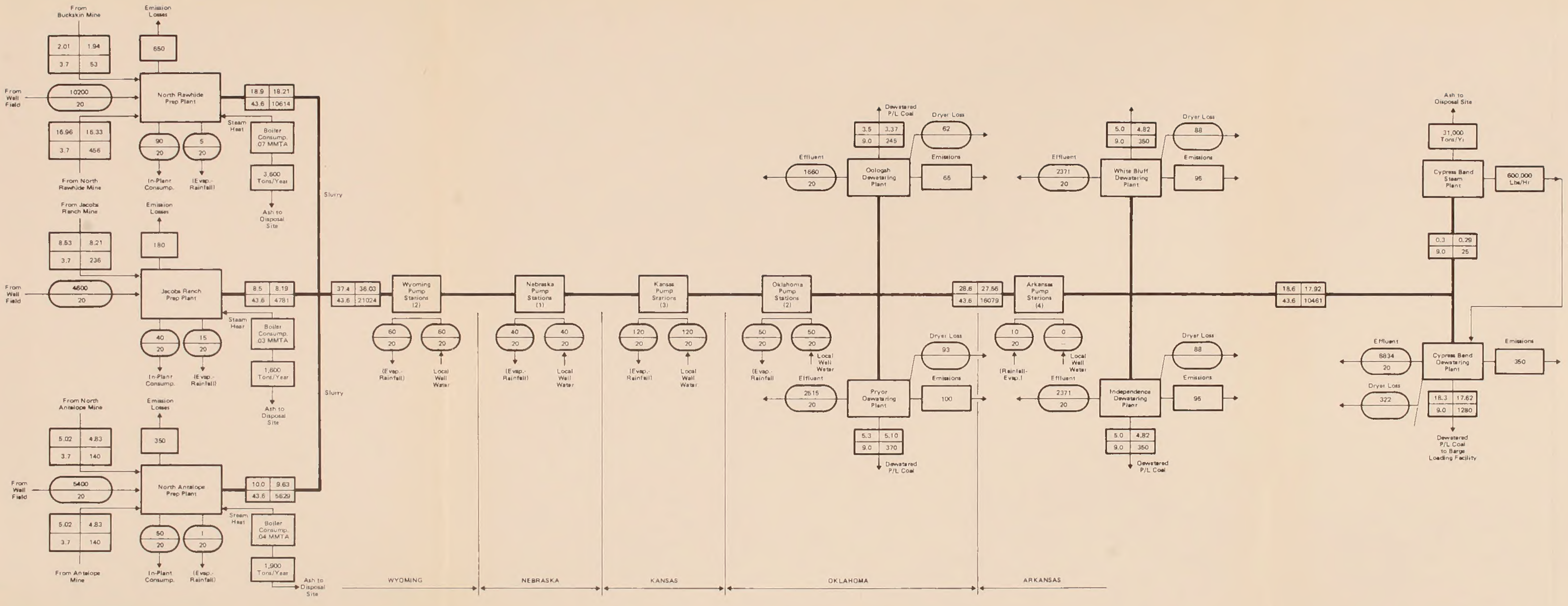
[b] See strip maps in Appendix A for description of symbols and locations of pump stations. There are only 15 different slurry pump station locations; pump station shown in brackets is at same location as first pump station listed in the row.

FIGURE 3-2b

ASSUMED PREPARATION AND DEWATERING PLANTS CONSTRUCTION SCHEDULE: CYPRESS BEND PIPELINE-BARGE ALTERNATIVE



* Millions of (short) tons annually



NOTES:

1. Assume as-mined surface moisture ≈ 3.7%.
2. Assume slurry @ 56.4% surface dry solids, which corresponds to 41.7% bone dry solids.
3. Assume dewatered P/L coal @ 9% surface moisture.
4. Evaporation and precipitation values taken from water atlas of the U.S.
5. Water exported from Wyoming (21,024 ac-ft/yr) includes 20,000 ac-ft/yr from well field and 1,024 ac-ft/yr from surface moisture of as-mined coal.
6. Coal-water balance based on 37.4 MMTA throughput.

LEGEND

Coal:	As-mined Coal (MMTA)	Surface Dry Coal (MMTA)
	Surface Moisture (%)	Surface Moisture (Acre-Ft/Yr)

Water: Water (Acre-Ft./Year) / TSS (ppm)

Emissions: Total Emissions (Tons/Yr)

Figure 3-3. SYSTEM MASS BALANCE: CYPRESS BEND PIPELINE-BARGE ALTERNATIVE

TABLE 3-3

ASSUMED QUARTERLY BUILDUP OF CONSTRUCTION WORK FORCE:
CYPRESS BEND PIPELINE-BARGE ALTERNATIVE

	1982	1983				1984				1985				1986				1987				1988				1989			
	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Well Field		41	41	41	41	41	41	41	41																				
Water and Slurry Gathering Lines		60	360	360	60	90																							
Preparation Plants	31[a]	124	172	209	291	343	419	348	304	94	70	76	68	116	58	59	67	61	36	52	81	91	65	59	67	56	25	18	5
Mainline Slurry Pipeline Construction			100	500	2560	2560	2560	2560	2560	300	100																		
Special River Crossings[b]						150	150	150	150																				
Slurry Pump Stations			175	452	644	1234	1300	1109	624																				
Communication System		20	20		20	20	20	20																					
Dewatering Plants		95	417	731	1102	1272	1108	839	376	92	157	197	267	266	244	190	160	110	150	190	190	190	190	190	160	110	90	60	30
Coal-Fired Plant		50	125	150	175	200	170	150	25																				
Maintenance Bases[c]																													
Testing & Startup											260	260																	
Total	31[a]	390	1410	2443	4893	5910	6028	5477	4085	486	587	533	335	382	302	249	227	171	186	242	271	281	255	249	227	166	115	78	35

Note: Numbers represent number of workers required.

[a] Initial mobilization work force.

[b] River crossings that may require separate construction contracts (Appendix D-6). Standard crossings are included in main slurry pipeline construction work force.

[c] Numbers of workers are incorporated in respective preparation and dewatering plant work force requirements.

Table 3-4. ASSUMED QUARTERLY CONSTRUCTION WORK FORCE FOR PREPARATION PLANTS: CYPRESS BEND PIPELINE-BARGE ALTERNATIVE

Preparation Plant	Capacity (MMTA)	1982	1983				1984				1985				1986				1987				1988				1989			
		4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
North Rawhide	18.9	20	62	84	105	144	166	181	141	166	9	20	51	56	102	40	38	18	5	11	34	76	86	54	38	18	5			
Jacobs Ranch	8.5	6	47	59	64	92	107	156	137	88	25																			
North Antelope	10.0	5	15	29	40	55	70	82	70	50	60	50	25	12	14	18	21	49	56	25	18	5	5	11	21	49	51	25	18	5
Total	37.4	31[c]	124	172	209	291	343	419	348	304	94	70	76	68	116	58	59	67	61	36	52	81	91	65	59	67	56	25	18	5

[c] Initial mobilization force.

TABLE 3-5

PIPELINE SPREAD CONSTRUCTION RESPONSIBILITIES: CYPRESS BEND PIPELINE - BARGE ALTERNATIVE

Spread	Pipeline Segment	Miles	Pipeline Outside Diameter (inches)	Manpower Requirement: Typical*	Manpower Requirement: Add for Rough Terrain
I	Jacobs Ranch to Milepost MB-12	390	46	670	78
II	Milepost MB-12 to Pryor (MP MB-408)	396	46	670	78
III	Pryor to Atkins Junction	102	40	610	78
IV	Jacobs Ranch to N. Antelope (Water)	16	12	260	-
	N. Antelope to Jacobs Ranch (Slurry)	16	24	360	-
	Jacobs Ranch to N. Rawhide (Water)	55	18	260	-
	N. Rawhide to Jacobs Ranch (Slurry)	55	32	360	-
	Jacobs Ranch to Well Field (Water)	68	26	260	-
V	Atkins Junction to White Bluff	80	36	550	65
	White Bluff to Cypress Bend	81	32	550	65
	Atkins Junction to Independence	93	16	260	-

Note: Spread I would proceed from south to north; spread IV would proceed as shown above; all remaining spreads would proceed from north to south.

* Numbers represent maximum number of workers per pipeline segment.

TABLE 3-6

SUMMARY OF OPERATING PERSONNEL: CYPRESS BEND PIPELINE - BARGE ALTERNATIVE

Location	Admin. & Support	Super-vision	Engrs. & Drafts-men	Techs. & Operators	Secs. & Clerks	Crafts-men & Laborers	Total
Headquarters	6	4	6	19	6	-	41
Subtotal	6	4	6	19	6	0	41
Western District (Jacobs Ranch)							
Administration	4	-	-	-	-	-	4
Water Supply	-	1	-	10	-	-	11
Preparation Plants	-	41	-	80	7	68	196
Pipeline	-	-	-	6	-	3	9
Maintenance Base	-	1	-	7	-	15	23
Subtotal	4	43	0	103	7	86	243
Central District (Pryor)							
Administration	3	-	-	-	-	-	3
Dewatering Plant	-	11	-	13	5	28	57
Pipeline	-	-	-	8	-	16	24
Maintenance Base	-	1	-	15	-	17	33
Subtotal	3	12	0	36	5	61	117
Eastern District (White Bluff)							
Administration	3	-	-	-	-	-	3
Dewatering Plants	-	42	-	47	20	101	210
Pipeline	-	-	-	12	-	6	18
Maintenance Base	-	4	-	7	-	36	47
Subtotal	3	46	0	66	20	143	278
Total	16	105	6	224	38	290	679

TABLE 3-7

SUMMARY OF MAINTENANCE BASE PERSONNEL: CYPRESS BEND PIPELINE - BARGE ALTERNATIVE

	Western District (Jacobs Ranch)	Central District (Pryor Site)	Eastern District (White Bluff)
Supervisor	1	1	1
Shop Foreman			3
Repairman/Welder			4
Machinist			4
Millwright			13
Senior Electrical Technician	1	1	1
Senior Instrumentation Technician	1	1	1
Senior Communications Technician	1	1	1
Communications Technician		3	
Computer Control Technician		3	
Electrical/Instrumentation Technician	3	4	3
Senior Mechanical Repairman	1	1	1
Repairman/Welder	4	4	4
Equipment Operator	1	2	1
Pipeliner	10	12	10
Total	23	33	47

North Rawhide plant would process 18.9 MMTA, the Jacobs Ranch plant would process 8.5 MMTA, and the North Antelope plant would process 10.0 MMTA. The schedules for the capacity buildup and the expansion of delivery capabilities of the plants to full capacity are shown in Table 3-8. Typical layouts of the preparation plants would be the same as those shown for the proposed action (Figures 1-6 and 1-7). Acreage requirements would be 110 for North Rawhide, 70 for Jacobs Ranch, and 65 for North Antelope.

3.G.2 COAL SLURRY PIPELINES AND PUMP STATIONS

The main slurry pipeline would extend approximately 1202 miles between the Jacobs Ranch plant and Cypress Bend. Pipeline distances from the mine sites to each of the proposed delivery terminals are shown in Table 3-9.

Data on pipeline diameters and lengths and the number of pump stations for this alternative market configuration are shown in Tables 3-10 and 3-11. The change in pipeline diameters from section to section reflects the projected reduced throughput as slurry is delivered to intermediate customers.

Construction

Coal Slurry Pipelines. The construction of the Cypress Bend pipeline-barge alternative main slurry pipeline and slurry gathering lines would disturb approximately 15,429 acres, and would take place during 1983 and 1984 (Figure 3-2a). A maximum work force of approximately 2,979 would be required (Table 3-3).

The construction techniques would be the same as those for the proposed action (Section 1.G.3).

This alternative would cross 35 rivers requiring special permits (Table 3-12). Communities near likely construction spread headquarters are listed in Table 3-13.

Pump Stations. Construction of the 15 slurry pump stations (3 of which are located within the preparation plant boundaries) would disturb approximately 300

Table 3-8. PROPOSED COAL DELIVERY SCHEDULE: CYPRESS BEND PIPELINE-BARGE ALTERNATIVE

Preparation Plant	Mine	Delivery Terminal	As Mined Coal (MMTA) 1985	1986	1987	1988	1989
North Rawhide	North Rawhide	Pryor, OK	2.65	5.3	5.3	5.3	5.3
	Buckskin	New Roads, LA[a]	2.0	2.0	2.0	2.0	2.0
	North Rawhide	Baton Rouge, LA[a]	-	5.8	5.8	11.3	11.3
	North Rawhide	Cypress Bend[b]	0.3	0.3	0.3	0.3	0.3
		Subtotal	4.95	13.4	13.4	18.9	18.9
Jacobs Ranch	Jacobs Ranch	Oologah, OK	3.5	3.5	3.5	3.5	3.5
	Jacobs Ranch	White Bluff, OK	5.0	5.0	5.0	5.0	5.0
		Subtotal	8.5	8.5	8.5	8.5	8.5
North Antelope	North Antelope	Independence, AR	5.0	5.0	5.0	5.0	5.0
	Antelope	Wilton, LA[a]	-	-	2.5	2.5	5.0
		Subtotal	5.0	5.0	7.5	7.5	10.0
		Total	18.45	26.9	29.4	34.9	37.4

[a] By barge from dewatering plant at Cypress Bend.
[b] For ETSI dewatering plant at Cypress Bend.

TABLE 3-9

PIPELINE DISTANCES FROM MINE SITES TO DELIVERY TERMINALS: CYPRESS BEND PIPELINE - BARGE ALTERNATIVE

Delivery Terminal	Quantity (MMTA)	Mine Location	Distance from Origin (miles)
Oologah	3.5	Jacobs Ranch	756
Pryor	5.3	North Rawhide	840
Independence	5.0	North Antelope	1057
White Bluff	5.0	Jacobs Ranch	1028
Cypress Bend	0.3	North Rawhide	1162
	2.0	Buckskin	1162
	11.3	North Rawhide	1162
	5.0	Antelope	1124

Note: Mileages are rounded to nearest whole number.

TABLE 3-10
COAL SLURRY PIPELINE DIMENSIONS: CYPRESS BEND PIPELINE - BARGE ALTERNATIVE

Pipeline Sections	Length Miles	Pipe O.D. Inches
N. Rawhide to Jacobs Ranch	55	32
N. Antelope to Jacobs Ranch	16	24
Jacobs Ranch to Ooloagah	756	46
Oolagah to Pryor	30	46
Pryor to Atkins Junction	162	40
Atkins Junction to Independence	93	16
Atkins Junction to White Bluff	80	36
White Bluff to Cypress Bend	81	32

Note: All numbers are rounded to nearest whole number.

TABLE 3-11

COAL SLURRY PIPELINE PUMP STATIONS: CYPRESS BEND PIPELINE BARGE ALTERNATIVE

State	County/Parish	Pipeline Segment	Milepost	Station Location	Pump Station Designation
Wyoming	Campbell	N. Rawhide to Jacobs Ranch	NR-0	North Rawhide	NR[a]
Wyoming	Campbell	N. Antelope to Jacobs Ranch	NA-0	North Antelope	NA[b]
Wyoming	Campbell	Jacobs Ranch to Oologah	PMBC-0	Jacobs Ranch	PMBC-1[c]
Wyoming	Niobrara	Jacobs Ranch to Oologah	PMB-60	-	MB-2
Wyoming	Niobrara	Jacobs Ranch to Oologah	PMB-98	-	MB-3
Nebraska	Garden	Jacobs Ranch to Oologah	PMB-247	-	MB-4
Kansas	Decatur	Jacobs Ranch to Oologah	MB-30	-	MB-5
Kansas	Ellsworth	Jacobs Ranch to Oologah	MB-172	-	MB-6
Kansas	Butler	Jacobs Ranch to Oologah	MB-252	-	MB-7
Oklahoma	Rogers	Oologah to Pryor	MB-378	Oologah	MB-8
Oklahoma	Mayes	Pryor to Atkins Junction	MB-407.5	Pryor	PMB-9
Arkansas	Crawford	Pryor to Atkins Junction	MB-482.5	-	MB-10
Arkansas	Pope	Atkins Jn. to Independence	PMB-997.4	Atkins Junction	PMB(I)-1[d]
Arkansas	Pope	Atkins Jn. to White Bluff	PMB-997.4	Atkins Junction	PMB-12[d]
Arkansas	Van Buren	Atkins Jn. to Independence	PMB(I)-39.0	-	PMB(I)-2
Arkansas	Jefferson	White Bluff to Cypress Bend	PMB-1077.6	White Bluff	B-1

Milepost and pump station designations are explained in Appendix A of the EIS.

[a] Pump station NR is located within the boundaries of the North Rawhide preparation plant.

[b] Pump station NA is located within the boundaries of the North Antelope preparation plant.

[c] Pump station PMBC-1 is located within the boundaries of the Jacobs Ranch preparation plant.

[d] Pump stations PMB(I)-1 and PMB-12 are located together at the same station location.

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TABLE 3-12

RIVER AND STREAM CROSSINGS REQUIRING SPECIAL PERMITS: CYPRESS BEND PIPELINE - BARGE ALTERNATIVE

	Name	Type Permit	State
1.	North Platte River	404	Nebraska
2.	South Platte River	404	Nebraska
3.	Republican River	404	Nebraska
4.	Saline River	404	Kansas
5.	Verdigris River	404	Oklahoma
6.	Neosho (Grand) River	404	Oklahoma
7.	Baron Fork River[a]	404	Oklahoma
8.	Illinois River[a]	10	Oklahoma
9.	Lee Creek	10	Arkansas
10.	Frog Bayou	404	Arkansas
11.	Little Mulberry	404	Arkansas
12.	Mulberry River	10	Arkansas
13.	White Oak Creek	404	Arkansas
14.	Spadra	404	Arkansas
15.	Little Piney	404	Arkansas
16.	East Fork Horsehead Creek	404	Arkansas
17.	Horsehead Creek	404	Arkansas
18.	Gum Log Creek	404	Arkansas
19.	Piney Creek	404	Arkansas
20.	Illinois Bayou	404	Arkansas
21.	Point Remove Creek (2)	10	Arkansas
22.	Arkansas River	10	Arkansas
23.	West Fork Point Remove Creek	404	Arkansas
24.	East Fork Point Remove Creek	404	Arkansas
25.	North Fork Cadron Creek	404	Arkansas
26.	Greers Ferry Lake	10	Arkansas
27.	Little Red River	404	Arkansas
28.	Big Creek	404	Arkansas

TABLE 3-12 Concluded

RIVER AND STREAM CROSSINGS REQUIRING SPECIAL PERMITS:
CYPRESS BEND PIPELINE - BARGE ALTERNATIVE

Name	Type Permit	State
29. White River (Newport terminal)	10	Arkansas
30. Cypress Creek	404	Arkansas
31. Fourche La Fave River	10	Arkansas
32. Harris Brake Lake	404	Arkansas
33. Big Maumelle River	404	Arkansas
34. Fourche Creek	404	Arkansas
CYPRESS BEND LATERAL		
35. Mississippi River - Barge Loading Facility	10	Arkansas

[a] Scenic river.

TABLE 3-13

COMMUNITIES NEAR LIKELY PIPELINE CONSTRUCTION SPREAD HEADQUARTERS: CYPRESS BEND PIPELINE - BARGE ALTERNATIVE

Community	County/Parish	State
Gillette	Campbell	Wyoming
Wright	Campbell	Wyoming
Lush	Niobrara	Wyoming
Scottsbluff	Scotts Bluff	Nebraska
Ogallala	Keith	Nebraska
McCook	Red Willow	Nebraska
Russell	Russell	Kansas
Wichita	Sedgwick	Kansas
Bartlesville	Washington	Oklahoma
Fort Smith	Sebastian	Arkansas
Russelville	Pope	Arkansas
Batesville	Independence	Arkansas
Pine Bluff	Jefferson	Arkansas
Dumas	Desha	Arkansas

acres of land. The stations would be constructed in 1983 and 1984 (Figure 3-2a). The construction work force would increase to approximately 1300 in 1984 (Table 3-3). Communities near the proposed pump station sites are listed in Table 3-14.

Pump stations would be located along the main slurry pipeline route to provide the required pumping pressure, as shown in Table 3-11 (also see maps in Appendix A of the EIS).

The major facilities would be the same as those described for the proposed action in Section I.G.3.

Operation, Maintenance, and Abandonment

Acreage. During project operation, the coal slurry pipelines and pump stations would require about 15,729 acres of land. Of this total, approximately 300 acres would be required for the 15 pump stations (3 of which are located within the preparation plant boundaries). Each 25-acre plot would be fenced.

Work Force. Approximately 51 people would be needed to operate the pipeline and associated pump stations, as shown in Table 3-6.

Maintenance. System maintenance would be the same as that described for the proposed action (Section 1.G.3).

Noise. Noise levels would be the same as those for the proposed action, with the addition of noise from the barge facilities. Noise levels along the barge route would depend on the current barge and ship traffic. Levels are expected to range from those of a typical suburban area, about 55 decibels (EPA 1974), to those of undeveloped rural areas, about 35 to 40 decibels (L_{dn} scale) (EPA 1974).

3.G.3 DEWATERING PLANTS (INCLUDING STEAM GENERATORS)

The dewatering plants for the Cypress Bend pipeline-barge alternative would be similar to those described for the proposed action, except for the plant

TABLE 3-14

COMMUNITIES NEAR PROPOSED PUMP STATION SITES: CYPRESS BEND PIPELINE - BARGE ALTERNATIVE

Pump Station	Community	County/Parish	State
NR	Gillette	Campbell	Wyoming
NA	Wright	Campbell	Wyoming
N-1	Lusk	Niobrara	Wyoming
PMBC-1	Wright	Campbell	Wyoming
MB-2	Lusk	Niobrara	Wyoming
MB-3	Lusk	Niobrara	Wyoming
MB-4	Ogallala	Keith	Nebraska
MB-5	Norton	Norton	Kansas
MB-6	Ellsworth	Ellsworth	Kansas
MB-7	Wichita	Sedgwick	Kansas
MB-8	Oologah	Rogers	Oklahoma
PMB-9	Pryor	Mayes	Oklahoma
MB-10	Fort Smith	Sebastian	Arkansas
PMB-12[a]	Atkins	Pope	Arkansas
B-1	Pine Bluff	Jefferson	Arkansas

[a] Pump station PMB(I)-1 is at the same location as this pump station.

at Cypress Bend. Since no power plant would be at this location, a coal-fired boiler would be required to supply the necessary heat. This boiler would burn coal at a rate of 300,000 tons per year to dewater the 18.3 MMTA of slurry coal. A pit would be provided for disposal of the coal ash.

Construction

Construction of the dewatering plants would begin in 1983 and be completed in 1989 (Figure 3-3b). A work force ranging from about 95 in early 1983 to a peak of 1272 in 1984 would be required, as shown in Table 3-3. No unusual construction procedures would be necessary for any of the dewatering plants. Construction of the coal-fired plant at Cypress Bend would require an initial work force of 50 in 1983, with a peak work force of 200 in 1984, as shown in Table 3-3.

Operation, Maintenance, and Abandonment

During project operation, a typical 5-MMTA dewatering plant would occupy about 10 acres of fenced land.

Approximately 267 people would be required to operate the dewatering plants (Table 3-6).

At project termination all facilities would be dismantled and removed. The disturbed acreage would be reclaimed.

3.G.4 BARGE LOADING FACILITY

The barge loading facility would be sized to load 18.3 MMTA of coal at Cypress Bend for delivery to downstream customers. This facility would operate in conjunction with a 18.3 MMTA dewatering plant.

This barge loading facility would receive feed from the surge bin and feeders within the dewatering plant. A 42-inch conveyor would transfer coal from this bin to a rail-mounted bucket-wheel stacker-reclaimer for stockpiling at an average rate of 5000 tons per hour.

The stacker-reclaimer would reclaim coal at a nominal rate of 3000 tons per hour for barge loading. Open stockpiles would be provided on both sides of the unit, with a combined capacity of approximately 200,000 tons, equal to about three days supply at the nominal barge loading rate. Dozers would be provided to work the dead area of the pile. An open-trench-type drainage system for the storage pile would be included. Drainage facilities will be designed to channel the runoff from the coal stockpile to a retention basin. Water will be reclaimed from the retention basin and used for dust suppression or treated and discharged along with slurry waste water.

The bucket-wheel stacker-reclaimer would discharge to a 60-inch conveyor that runs the length of the stockpiles. Another 60-inch conveyor would transfer the coal to the barge loader. The conveyor system would be designed to move up to 4500 tons per hour, to handle surges resulting from the bucket-wheel stacker-reclaimer operation.

The barge terminal would provide for two 1000-foot-long staging areas for full and empty barges in addition to the loading area, where a winch system would be provided to inch the barges during loading. The plot plan for the 18.3-MMTA dewatering plant and barge loading facility is shown in Figure 3-1.

The barge terminal dock, would be located parallel to the bank of the river. The riverward face of the dock would be far enough offshore to provide 10 feet of water depth at normal low water. The dock would be approximately 3000 feet long. It would be constructed by installing a group of sheet piles spanning its length. The dock would be connected to shore by means of a walkway alongside the conveyor.

Construction

Construction of the barge loading facility would employ standard techniques for a physical plant of this size. No unique requirements are foreseen.

Concrete foundations would be poured for all structures. The conveyor system and stacker-reclaimer would be shipped to the site by truck or rail and would be assembled on the foundations.

The barge terminal dock would be constructed by driving the sheet piles from a barge operation. No dredging would be required. After installation of the sheet piling, the conveyor would be installed along with a shore-connected walkway. Ancillary facilities such as the barge-loading system would be installed to complete the facility.

Barge unloading facilities would be owned by the various power plants, and thus are not part of this project.

Operation, Maintenance, and Abandonment

During project operation the dewatering plant and barge loading facility would occupy a 205-acre fenced plot.

Approximately 20 people would be required to operate the barge loading facility at a throughput of 18.3 MMTA. This staff is included with the operating personnel shown for the dewatering plants (Eastern District) in Table 3-6.

Barges would be loaded on a round-the-clock schedule at a rate of approximately two 1500-ton capacity barges per hour. Fifteen to 20 barges would make up each tow for delivery to power plants at New Roads, Baton Rouge, and Wilton, Louisiana. There would be an average of two tows per day leaving the facility. Each tow would move downriver at about 5 knots, thus taking about four days to make each trip.

A single tugboat would be required for each tow. At project termination, all surface facilities would be removed and the disturbed acreage reclaimed.

3.G.5 ANCILLARY FACILTIES

The ancillary facilities would be the same as described for the proposed action, except for the power requirements (see Section 1.G.5). Table 3-15 lists system power requirements and sources.

TABLE 3-15

POWER REQUIREMENTS AND SOURCE IDENTIFICATION: CYPRESS BEND PIPELINE-BARGE ALTERNATIVE

Facility	Kilowatt Demand	Source	Transmission Line (Miles)
Water Well Field	9,500	115 kV - Niobrara Electric Association, Inc.	30
Pump Station N-1 (water)	11,300	69 kV - Niobrara Electric Association, Inc.	Tap
N. Rawhide Prep. Plant	30,200	69 kV - Tri-County Electric Assoc., Inc.	12
Pump Station N-2 (water)	1,400	69 kV - Tri-County Electric Assoc., Inc.	Tap
N. Rawhide Pump Stn.	8,300	69 kV - Tri-County Electric Assoc., Inc.	12
N. Antelope Prep. Plant	16,000	69 kV - Tri-County Electric Assoc., Inc.	Tap
Pump Station N-3 (water)	500	69 kV - Tri-County Electric Assoc., Inc.	Tap
N. Antelope Pump Stn.	1,500	69 kV - Tri-County Electric Assoc., Inc.	Tap
Jacobs Ranch Prep. Plant	13,600	69 kV - Tri-County Electric Assoc., Inc.	Tap
Pump Station PMBC-1	10,300	69 kV - Tri-County Electric Assoc., Inc.	Tap
Pump Station MB-2	9,600	69 kV - Niobrara Electric Assoc., Inc.	15
Pump Station MB-3	9,600	69 kV - Niobrara Electric Assoc., Inc.	38
Pump Station MB-4	9,600	34.5 kV - Wheat Belt Public Power District	9

TABLE 3-15 (concluded)

Facility	Kilowatt Demand	Source	Transmission Line (Miles)
Pump Station MB-5	9,600	115 kV - McCook Public Power District	2
Pump Station MB-6	9,600	115 kV - Norton/Decatur Electric Cooperative	2
Pump Station MB-7	9,600	69 kV - Butler Rural Electric Cooperative, Inc.	4
Oologah Dewatering Plant	6,000	Public Service Company of Oklahoma	Tap
Pump Station MB-8	9,600	Public Service Company of Oklahoma	Tap
Pryor Dewatering Plant	7,200	Grand River Dam Authority	Tap
Pump Station PMB-9	9,600	Grand River Dam Authority	Tap
Pump Station MB-10	9,600	69 kV - Cookson Hills Cooperative, Inc.	4
Pump Stations PMB(I)-1, and PMB-12	11,100	161 kV - Arkansas Power & Light Co.	Tap
Pump Station PMB(I)-2	3,100	161 kV - Arkansas Power & Light Co.	4
Independence Dewatering Plant	8,000	Arkansas Power & Light Co.	Tap
White Bluff Dewatering Plant	8,000	Arkansas Power & Light Co.	Tap
Pump Station B-1	10,600	Arkansas Power & Light Co.	Tap
Cypress Bend Dewatering Plant	28,000	Arkansas Power & Light Co.	Tap

Note: Tap includes $\leq$ 1 mile of new transmission line.

3.H SYSTEM NONROUTINE OPERATIONS

Nonroutine operations are described in Section 1.J.

3.I INTERRELATIONSHIP OF THE CYPRESS BEND PIPELINE-BARGE ALTERNATIVE WITH OTHER PLANNED PROJECTS

The interrelationship of the Cypress Bend pipeline-barge alternative with other planned projects would be the same as that described for the proposed action except for the increase in barge traffic on the Mississippi River (see Section 1.K).

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CHAPTER 4
COLORADO ALTERNATIVE

4.A GENERAL DESCRIPTION

The Colorado alternative slurry pipeline route would bypass Nebraska by going south through Colorado as shown on Map 1-1. This alternative northern segment could be connected in Kansas to either the proposed action, market alternative or Cypress Bend pipeline-barge alternative. For the purposes of this discussion, the Colorado alternative slurry pipeline route is considered to end at the point where it intersects the market alternative main slurry pipeline route. Only the sections of the aforementioned routes in the states of Wyoming, Nebraska, and Kansas would be affected. The relocated section of the pipeline route called the Colorado alternative slurry pipeline route, measures 602 miles between Jacobs Ranch, Wyoming, which is the starting point of the main slurry pipeline, and the point where it would join the market alternative main slurry pipeline. This represents an increase of 42 miles in length over the more direct market alternative route. Six mainline pump stations would be located on this segment of the route. The same quantity of coal, 37.4 MMTA, would be obtained from the same mines and supplied to the same delivery terminals as in the market alternative. Therefore, all aspects of the Colorado alternative, except those affected by change in route, would be the same as for the market alternative, as described in Chapter 2.

The details of the Colorado alternative that differ from those of the proposed action are discussed below.

4.B WATER REQUIREMENTS

The water requirements for the six main slurry pipeline pump stations are shown below.

State	Water Requirements (acre-ft/year)	Number of Main Slurry Pipeline Pump Stations
Wyoming	60	2*
Colorado	90	2
Kansas	70	1

4.C ACREAGE REQUIREMENTS AND LAND STATUS

Construction of this alternative pipeline segment would require approximately 7,296 acres of land and approximately 150 additional acres for six pump stations (one of which, PCMB-1, is located within the Jacobs Ranch preparation plant). The land status for this alternative is shown in Table 4-1. All of the approximately 7,296 right-of-way acres would be reclaimed and returned to their preconstruction use wherever possible. River crossings requiring special permits for this segment are listed in Table 4-2.

4.D TIME FRAME

The time frame for construction of this alternative segment would be essentially the same as that for the proposed action (see Section 1.E for more details).

4.E PROJECT COMPONENTS

Project components for this alternative segment would be conceptually the same as those described for the proposed action, with the exception of the locations of the main slurry pipeline pump stations (see strip maps in Appendix A of the EIS). Tables 4-3 and 4-4 provide detailed data on the main slurry pipeline and pump stations. Table 4-5 lists communities near likely construction spread headquarters, and Table 4-6 lists communities near the proposed pump station sites. Table 4-7 lists power requirements and sources for pump stations.

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* One main slurry pipeline pump station (PMBC-1) in Wyoming was not included because it would obtain makeup water from the Madison Formation (Niobrara well field) instead of from an individual well.

LAND STATUS AND ACREAGE: COLORADO ALTERNATIVE

			Right-of-Way									
			Private		Federal				State		Pump Stations	
					Forest Service		BLM					
State	Pipeline Segment	Total Miles	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	Miles	Acres[a]	All Private Acres	Total Acres
Wyoming	J.R.-WY/CO Border (slurry)	210	173	2,097	30	364	3	36	4	48	75	2,620
	Subtotal	210	173	2,097	30	364	3	36	4	48	75	2,620
Colorado	WY/CO Border-CO/KS Border	139	122	1,479	-	-	-	-	17	206	50	1,735
	Subtotal	139	122	1,479	-	-	-	-	17	206	50	1,735
Kansas	CO/KS Border - MP C-602	253	253	3,066	-	-	-	-	-	-	25	3,091
	Subtotal	253	253	3,066	-	-	-	-	-	-	25	3,091
Total		602	548	6,642	30	364	3	36	21	254	150	7,446

Note: Numbers are rounded to nearest whole number. No Indian lands would be crossed by this route.

[a] Construction acreage shown; acreage is based on 100-ft right-of-way for private, federal, and state lands.

Legend

J.R. = Jacobs Ranch
WY = Wyoming
CO = Colorado
KS = Kansas

TABLE 4-2
RIVER AND STREAM CROSSINGS REQUIRING SPECIAL PERMITS: COLORADO ALTERNATIVE

	Name	Type Permit	State
1.	North Platte River	404	Wyoming
2.	South Platte River	404	Colorado
3.	Arkansas	404	Kansas

Note: No scenic rivers would be crossed by this alternative pipeline segment.

TABLE 4-3

COAL SLURRY PIPELINE DIMENSIONS: COLORADO ALTERNATIVE

Pipeline Segment	Length (miles)	Pipe O.D. (inches)
Jacobs Ranch to Intersection with Proposed Action Pipeline	519	46
Jacobs Ranch to Intersection with Market Alternative Pipeline	602	46

TABLE 4-4

COAL SLURRY PIPELINE PUMP STATIONS: COLORADO ALTERNATIVE

State	County/Parish	Pipeline Section	Mile Post	Station Location	Pump Station Designation
Wyoming	Campbell	Jacobs Ranch to Oologah	PMBC-0	Jacobs Ranch	PMBC-1
Wyoming	Niobrara	Colorado Alternative	C-60	-	C-2
Wyoming	Niobrara	Colorado Alternative	C-80	-	C-3
Colorado	Weld	Colorado Alternative	C-229	-	C-4
Colorado	Yuma	Colorado Alternative	C-345	-	C-5
Kansas	Ellis	Colorado Alternative	C-519	-	C-6

TABLE 4-5

COMMUNITIES NEAR LIKELY PIPELINE CONSTRUCTION SPREAD HEADQUARTERS: COLORADO ALTERNATIVE

Community	County	State
Gillette	Campbell	Wyoming
Wright	Campbell	Wyoming
Lusk	Niobrara	Wyoming
Cheyenne	Laramie	Wyoming
Sterling	Logan	Colorado
Colby	Thomas	Kansas
Hays	Ellis	Kansas
Wichita	Sedgwick	Kansas

TABLE 4-6

COMMUNITIES NEAR PROPOSED PUMP STATION SITES: COLORADO ALTERNATIVE

Pump Station	Community	County	State
PMBC-1	Wright	Campbell	Wyoming
C-2	Lusk	Niobrara	Wyoming
C-3	Lusk	Niobrara	Wyoming
C-4	Sterling	Weld	Colorado
C-5	Wray	Yuma	Colorado
C-6	Hays	Ellis	Kansas

Table 4-7. PUMP STATION POWER REQUIREMENTS AND SOURCE IDENTIFICATION: COLORADO ALTERNATIVE

Facility	Kilowatt Demand	Source	Transmission Line (Miles)
Pump Station PMBC-1	10,300	69 kV - Tri-County Electric Association, Inc.	Tap
Pump Station C-2	10,300	69 kV - Niobrara Electric Association	28
Pump Station C-3	10,300	69 kV - Niobrara Electric Association	38
Pump Station C-4	10,300	35.5 & 115 kV - Rural Electric Co.	18 @ 115 kV 7 @ 34.5 kV
Pump Station C-5	10,300	115 kV - Y-W Electric Assoc.	10
Pump Station C-6	10,300	69 kV - Western Coop. Electric Assoc., Inc.	9

Note: Tap includes $\leq$ 1 mile of new transmission line.

4.F INTERRELATIONSHIP OF COLORADO ALTERNATIVE WITH OTHER PLANNED PROJECTS

The interrelationship of the Colorado alternative with other planned projects would be similar to that for proposed action (Section 1.K, Wyoming projects only).

CHAPTER 5
COAL CLEANING ALTERNATIVE

5.A GENERAL DESCRIPTION AND LOCATION

Depending upon final contractural arrangements with the power plants, it may be beneficial to clean the coal prior to shipping. To accomplish this alternative, coal cleaning plants would be constructed at the coal slurry preparation plants at Jacobs Ranch, North Rawhide, and North Antelope, Wyoming.

The coal would be delivered to the cleaning facilities by conveyor belt. It would be wet-screened into coarse and fine portions. Several washing operations would take place at various stages of the coal crushing operation, and the waste material would be separated from the coal. These wastes would then be dewaterd and transported to the mine sites for disposal. The crushed coal would be weighed and sampled prior to its delivery to the slurry preparation plant. Table 5-1 shows the estimated quantity and composition of the wet rejects that would be disposed of at the mines.

5.B ACREAGE REQUIREMENTS AND LAND STATUS

Since the coal cleaning plants would be constructed within the boundaries of the coal slurry preparation plants, no additional acreage would be required; nor would the project land status change.

5.C WATER REQUIREMENTS

A total of 300 acre-feet of water per year would be consumed in the coal cleaning operation. This water would be obtained from the water supply system

TABLE 5-1

ESTIMATED WASTE: COAL CLEANING ALTERNATIVE

	Proposed Action		Market Alternative		Barge Alternative	
	Plant Size (MMTA)	Wet Rejects (MMTA)	Plant Size (MMTA)	Wet Rejects (MMTA)	Plant Size (MMTA)	Wet Rejects (MMTA)
North Antelope	10	0.5 to 1.0	10	0.5 to 1.0	10	0.5 to 1.0
North Rawhide	5	0.25 to 0.5	13.1	0.75 to 1.5	18.9	1.0 to 2.0
Jacobs Ranch	22.4	1.0 to 2.0	14.3	0.75 to 1.5	8.5	0.5 to 1.0

Surface moisture:	15 - 20% by weight
Bulk density (dry basis):	60 - 80 lb/ft^3
Heat energy (dry):	3000 - 6000 Btu/lb
Total sulfur (dry):	4 - 14% by weight
Pyritic sulfur (dry):	3 - 13% by weight
Ash (dry):	35 - 75% by weight

being used for the pipeline operation. If the coal cleaning alternative were used, the total water requirements for the proposed coal slurry transportation project would be 20,800 acre-feet of water per year, including the 300 acre-feet per year from local wells.

5.D TIME FRAME

The coal cleaning plants would be constructed in phases between 1983 and 1989 at the same time as the phased slurry preparation plants.

5.E WORK FORCE

Construction of the coal cleaning facilities would require the work force for the slurry preparation plants (as shown in Tables 1-7, 2-5, and 3-4) to be increased by about one-fourth.

5.F PROJECT COMPONENTS

The coal cleaning plant capacity would correspond to that of the associated preparation plant. Thus, if the coal cleaning process were used in conjunction with the proposed action, the cleaning plant capacity would be 22.4 MMTA at Jacobs Ranch, 5 MMTA at North Rawhide, and 10 MMTA at North Antelope. Refer to Tables 2-1 and 3-8 for the corresponding capacities for the market and Cypress Bend pipeline-barge alternatives.

The as-mined coal would be delivered to the cleaning plants by conveyor belt. The coal would be wet-screened into coarse and fine fractions. The coarser coal (larger than 3/8 inch) would be washed on a Baum jig to remove mine waste. The middlings from the Baum jig would then be crushed to less than 3/8 inch and combined with the finer fraction. The composite fine-coal product would be washed to remove additional mine waste. The middlings from the Batac jig would be further washed with cyclones and classifiers to eliminate high-ash slimes. After dewatering, all waste from the plant would be collected on a conveyor for transfer to the truck transfer bin. Refuse would be trucked back to the mine sites for disposal. Belt scales and a sampling station would be installed to ascertain the quality and quantity of the coal going to the preparation plants. A typical plant layout is shown in Figure 5-1. Figure 5-2 provides the system mass balance for the coal cleaning alternative, using the proposed action case.

5.F.1 CONSTRUCTION

Each site would be cleared, leveled, compacted, and graveled as necessary to support the permanent facilities. Whenever possible, existing topographic features and vegetation would be taken into consideration in selecting the locations of the buildings, roads, and other structures in order to minimize the amount of disturbed acreage and to blend the structures with the natural terrain. All exposed structures would be designed so that their configurations or forms and material types, textures, and colors would reduce their visibility.

Electric power for the coal cleaning plants would be obtained from the slurry preparation plant supply.

5.F.2 OPERATION, MAINTENANCE, AND ABANDONMENT

Personnel required to operate the coal cleaning plants would be integrated into the staff operating the slurry preparation plants, increasing the total by one-fourth over that shown in Tables 1-12, 2-7, and 3-6. The total number of workers required for operation of the preparation plants would be 245 for the proposed action, market alternative, and barge alternatives.

At project termination all surface facilities associated with the coal cleaning plants would be removed. The disturbed acreage would then be reclaimed, including reseeding when required by the landowner or surface management agency.

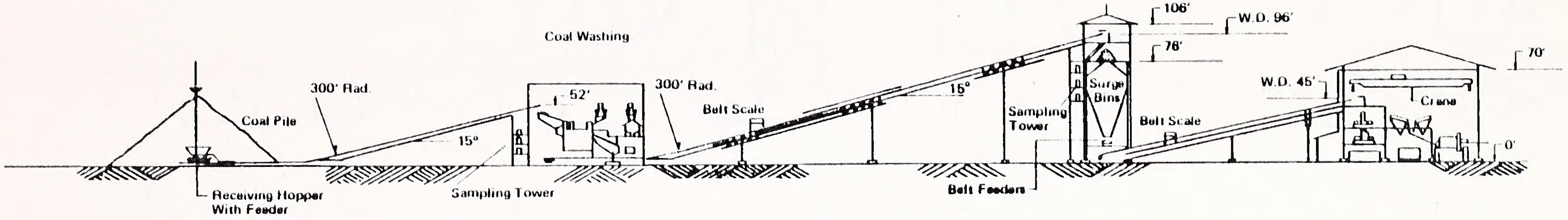
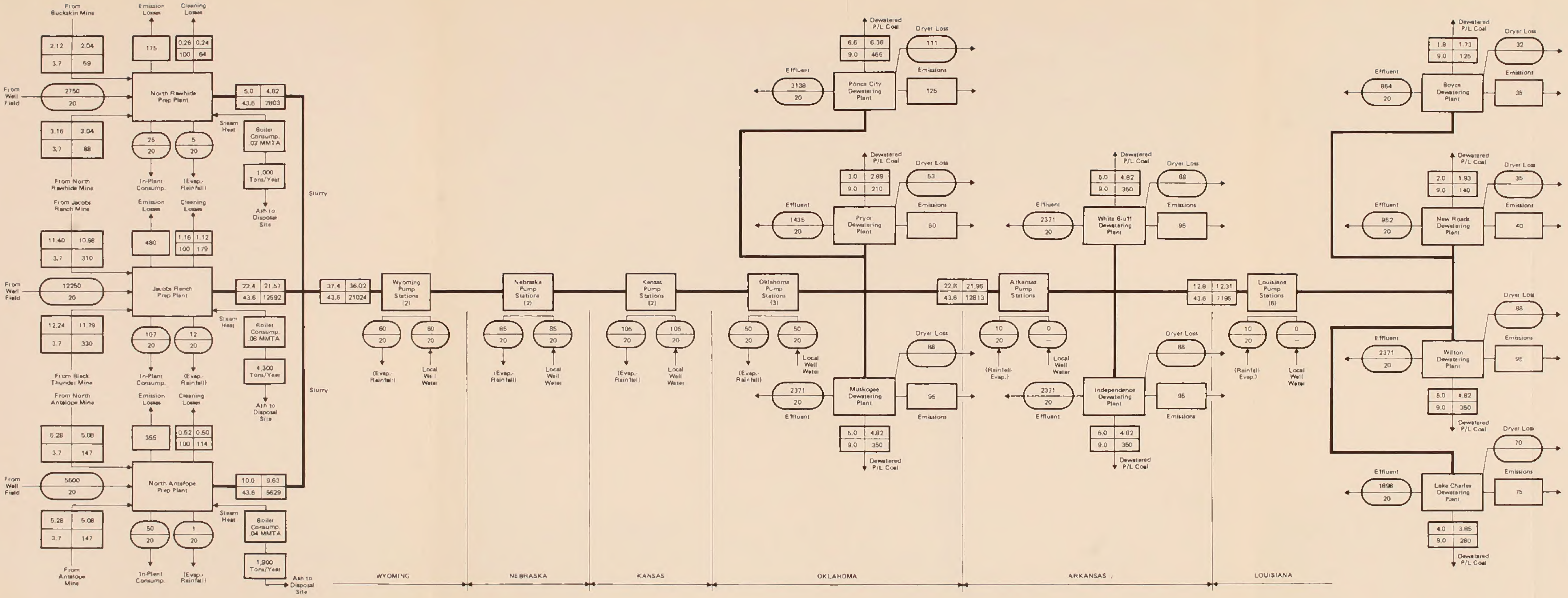


Figure 5-1. COAL CLEANING PLANT LAYOUT



NOTES:

1. Assume as-mined surface moisture ≅ 3.7%.
2. Assume slurry @ 56.4% surface dry solids, which corresponds to 41.7% bone dry solids.
3. Assume dewatered P/L coal @ 9% surface moisture.
4. Evaporation and precipitation values taken from water atlas of the U.S.
5. Water exported from Wyoming (21,024 ac-ft/yr) includes 20,000 ac-ft/yr from well field and 1,024 ac-ft/yr from surface moisture of as-mined coal.
6. Coal-water balance based on 37.4 MMTA throughput

LEGEND

Coal:

As-mined Coal (MMTA)	Surface Dry Coal (MMTA)
Surface Moisture (%)	Surface Moisture (Acre-Ft/Yr)

Water:

Water (Acre-Ft./Year)
TSS (ppm)

Emissions:

Total Emissions (Tons/Yr)

Figure 5-2. SYSTEM MASS BALANCE FOR PROPOSED ACTION: COAL CLEANING ALTERNATIVE

5.G INTERRELATIONSHIP OF COAL CLEANING ALTERNATIVE WITH OTHER PLANNED PROJECTS

Construction of the coal cleaning plants would have the same interrelationship with other planned construction projects in the Wyoming area as the proposed action (Section 1.K).

CHAPTER 6
CROOK COUNTY ALTERNATIVE WATER SUPPLY SYSTEM

6.A GENERAL DESCRIPTION

An alternative deep-well water system would be drilled into the Madison Formation northeast of Gillette in Crook County, Wyoming, as shown on Map 1-1.

A total of 20,200 acre-feet of water would be obtained from approximately 20 production wells drilled to an average depth of 4000 feet and rated at 650 gallons per minute each. Approximately 2.5 acres would be required for construction of each well, but only 0.5 acre per well would be required during operation. The wells would be equipped with submersible pumps driven by electric motors. Power to the pumps would be supplied by a transmission line distribution network for a substation located at the main pump station. Power to the substation would come from the Tri-County Electric Association. In addition to the 20 production wells, 4 monitoring wells would be drilled at suitable locations.

The well field water gathering system would consist of approximately 31 miles of 6- to 16-inch-diameter buried steel pipe. The pipelines would be constructed in a 50-foot right-of-way and would be located adjacent to access roads using existing unimproved roads wherever possible for access. A well-field pump station and surge tank would be installed on a 3-acre fenced plot. Water would be pumped through 43 miles of 26-inch (O.D.) steel pipeline (constructed in a 100 foot wide right-of-way) to a distribution head tank at North Rawhide. About 2700 acre-feet per year would be used in the North Rawhide preparation plant; the rest of the water would be pumped through 55 miles of 24-inch (O.D.) steel pipeline to a distribution head tank at Jacobs Ranch. Further distribution and uses of the water would be the same as described for the proposed action. Table 6-1 provides a summary of the Crook County alternative water pipeline

TABLE 6-1

SUMMARY OF WATER PIPELINES AND PUMP STATIONS: CROOK COUNTY ALTERNATIVE WATER SUPPLY SYSTEM

Pipeline Section	Length (miles)	Pipe O.D. (inches)	Pump Stations	Pumps per Station	Horsepower per Pump	Installed Horsepower per Station	Throughput (acre-feet/year)
Crook County Well Field to North Rawhide	43	26	1	2	3750	7500	20,200
North Rawhide[a] to Jacobs Ranch	55	24	1	2	3500	7000	17,500

[a] This pipeline section right-of-way is also part of the proposed action.

system, including pump station locations and specifications. Should this alternative be constructed, utilization of the Gillette water supply for reserve, if needed, would be as described in the description of the Niobrara well field under the proposed action.

6.B ACREAGE REQUIREMENTS

The Crook County alternative water supply system would require a total of approximately 770 acres during construction and 15 acres during operation.

6.C TIME FRAME

The time frame for construction of the Crook County alternative would be the same as shown for the Niobrara County water supply system (Figure 1-2).

6.D WORK FORCE

The number and type of construction workers would be the same as for the Niobrara County water supply system (Table 1-4).

6.E PROJECT COMPONENTS

Construction and operation of the water wells, gathering pipelines, pump stations, delivery pipelines, access roads, and transmission line network would be the same as described for the Niobrara County water supply system of the proposed action.

6.F INTERRELATIONSHIP OF CROOK COUNTY ALTERNATIVE WITH OTHER PLANNED PROJECTS

Other planned projects would be the same as those Wyoming projects listed in Table 1-21 for the proposed action.

CHAPTER 7

OAHE ALTERNATIVE WATER SUPPLY

7.A GENERAL DESCRIPTION

Another alternative source of water for the proposed coal slurry pipeline project would be the Oahe Reservoir on the Missouri River in South Dakota. This reservoir is located approximately 260 miles east of Gillette, Wyoming (Map 1-1). To develop this alternative it would be necessary to construct approximately 276 miles of new pipeline right-of-way across western South Dakota into Wyoming. The system would be designed as a joint venture between the applicant and the state of South Dakota for a throughput of 30,200 acre-feet per year, of which 10,000 acre-feet per year would be for designated urban and rural areas in South Dakota, generally along the pipeline route, and 20,200 acre-feet per year would be for ETSI's use. Table 7-1 lists the names of communities and areas to be served and the drop-off quantities and locations. For small quantities, the pipeline would be directly tapped; in other cases, lateral lines from the pipeline would supply a number of drop-off points.

Table 7-2 gives the pipeline section diameters, pump station locations, and horsepower and section capacities for the Oahe alternative water supply pipeline. The pipeline would terminate at the head tank at the North Rawhide preparation plant with the last ten miles in common right-of-way with the North Rawhide to Jacobs Ranch slurry gathering line. From North Rawhide the water supply system described for the proposed action would transport water to the Jacobs Ranch and North Antelope preparation plants.

7.B ACREAGE REQUIREMENTS AND LAND STATUS

Construction of the 100-foot-wide easement would disrupt approximately 3345 acres of land. The construction easement would revert to a 50-foot-wide

TABLE 7-1

DISTRIBUTION OF WATER FROM OAHE ALTERNATIVE WATER SUPPLY SYSTEM

Distribution Points			Towns/Facilities Served	
Milepost	Pump Station Location	Water Distributed (ac-ft/yr)	Location	Water Delivered (ac-ft/yr)
0 - 0	Oahe Res.	30,500	Receive from Oahe Reservoir	
0 - 45	Cheyenne	1378	Cheyenne (rural)	1378.0
0 - 96	Philip	2,247.2	Philip	134.0
			Wall	239.9
			Wasta	22.0
			Cedar (rural)	35.0
			Kadoka	135.8
			Belvedere	11.0
			Okaton	6.0
			Murdo	66.3
			White River	157.0
			Draper	20.3
			Lyman-Jones (rural)	1153.0
			Vivian	29.2
			Presho	116.0
			Kennebec	80.5
			Reliance	41.2
0 - 138	New Underwood	452.8	New Underwood	21.8
			Box Elder	280.0
			Hermose	45.0
			Hermosa (rural)	106.0
0 - 163	Alkali	1,226.0	Alkali (rural)	22.0
			Sturgis	1204.0
0 - 174	Whitewood	303.0	Whitewood	269.0
			Butte-Meade (rural)	34.0
0 - 196	Belle Fourche	4,393.0	Belle Fourche	1518.0
			Unaccounted	2875.0
0 - 214	Sundance	-	-	-
0 - 287	North Rawhide	20,500.0	North Rawhide preparation plant	20,500

TABLE 7-2

WATER SUPPLY PIPELINE AND PUMP STATIONS: OAHE ALTERNATIVE WATER SUPPLY SYSTEM

Pipeline Segment[a]	Length (miles)	O.D. (inches)	Pump Stations	Mile-post	Pumps per Station	Horsepower per Pump	Installed HP/Station	Throughput (ac-ft/yr)
MP 0-0 to 0-96	96	34	1	0-0	6	2000	12,000	30,200
			1	0-45	6	2000	12,000	30,200
MP 0-96 to 0-138	42	32	1	0-96	4	1750	7,000	26,575
MP 0-138 to 0-163	25	32	1	0-138	4	1500	6,000	26,122
MP 0-163 to 0-174	11	32	1	0-163	3	1500	4,500	24,896
MP 0-174 to 0-196	22	30	1	0-174	4	1000	4,000	24,593
MP 0-196 to 0-287	91	28	1	0-196	4	2000	8,000	20,200
			1	0-214	4	2000	8,000	20,200

---

[a] Mileposts are located on the strip maps in Appendix A of the EIS.

permanent right-of-way after completion of the system, or to approximately 1673 acres.

Eight pumping stations would be required along the route. Each station would require approximately 1 acre of fenced land; thus an additional 8 acres would be permanently changed from their preconstruction use. The land along the proposed route is 95 percent private, 3 percent state, and 2 percent federally controlled.

7.C TIME FRAME

Construction of the proposed water supply system would take two years, from January 1983 through December 1984.

7.D PROJECT COMPONENTS

7.D.1 PIPELINE

Construction

The 28-inch to 34-inch (O.D.) water pipeline would be buried for its entire length. Construction procedures would follow standard techniques for underground pipelines. These construction techniques are described in detail in the section on the construction of the coal slurry pipeline. A single spread of approximately 200 workers would lay the pipe.

Operation, Maintenance, and Abandonment

Operation and maintenance of the pipeline would be similar to that described for the slurry pipeline (Section 1.G.3). A staff of 12 would be required to operate and maintain the system. If the system were abandoned, the pipe would be left in the ground and the surface right-of-way would be allowed to revert to its original state.

7.D.2 PUMP STATIONS

Construction

Eight pump stations would be constructed along the pipeline, as shown in Table 7-2. Each station would be above ground in a fenced compound approximately one acre in size. The pumps would be electrically powered, thus requiring construction of transmission lines from the nearest source. Construction of each station would involve land preparation; pouring of concrete foundations, installation of the pumping machinery; and construction of housing, access roads, and fencing. A crew of 30 workers would require approximately three months to construct each station.

Operation, Maintenance, and Abandonment

Each pump station would operate automatically. A monitoring station would be constructed at the reservoir for flow control.

Should the proposed system be abandoned, all aboveground buildings and appurtenances would be removed and the land would be allowed to revert to its preconstruction use.

7.E RESERVE WATER SUPPLY

See Section 1.G.2 for a description of the reserve water supply.

7.F INTERRELATIONSHIP OF THE OAHE WATER SUPPLY ALTERNATIVE WITH OTHER PLANNED PROJECTS

The Oahe alternative, as proposed, would provide the necessary water supply for the coal slurry system. Similar projects have been proposed, such as the West River Aqueduct (CH2M Hill 1978) in which larger volumes of water (170,000 acre-feet per year) would be pumped from the Missouri River for use in western South Dakota and in Wyoming.

CHAPTER 8

SLURRY PIPELINE WATER DISCHARGE ALTERNATIVE

8.A GENERAL DESCRIPTION

According to plans for the proposed action, residual water from the slurry dewatering facilities would be used by the power plants at each coal delivery point.

An alternative disposal method would be to discharge the treated slurry water into nearby rivers or streams. Table 8-1 lists the potential points of discharge, the streams or rivers involved, and the approximate volumes of the water to be discharged. Water treatment facilities would be installed as necessary to meet the NPDES requirements.

8.B INTERRELATIONSHIP OF WATER DISCHARGE ALTERNATIVE WITH OTHER PLANNED PROJECTS

No other pertinent planned projects have been identified.

TABLE 8-1

ALTERNATIVE DISCHARGE OF DEWATERING PLANT EFFLUENT INTO LOCAL RECEIVING WATERS

Site	Receiving Water	Discharge Quantity[a] Maximum gpm	Discharge Quantity[a] Acre-Feet per Year
Ponca City, OK[b]	Arkansas River, 29 miles downstream of Ponca City	2190	3540
Oologah, OK[c,d]	Verdigris River, 1 mile downstream of Oologah Dam	1125	1820
Pryor, OK[b,c,d]	Neosho River (Grand River), 40 miles upstream of confluence with Arkansas River	1760	2845
Muskogee, OK[b]	Arkansas River, 4 miles downstream of confluence with Neosho River (Grand River)	1645	2660
Independence, AR[b,c,d]	White River, between mouth and Lock & Dam 3, 20 miles downstream from Lock 4, Dam 1 at Batesville	1660	2685
White Bluff, AR[b,c,d]	Arkansas River, 25 miles downstream of Little Rock, between Lock & Dam 5 & 6	1660	2685
New Roads, LA[b,c]	Mississippi River, 35 miles upstream of Baton Rouge	660	1065
Baton Rouge, LA[c]	Mississippi River, Baton Rouge	1660	2685
Wilton, LA[b,c]	Mississippi River, 13 miles downstream of Donaldsonville	1660	2685
Boyce, LA[b,c]	Red River, 3 miles upstream of Boyce	580	940
Lake Charles, LA[b,c]	Calcasieu River, Lake Charles	1330	2150
Cypress Bend, AR[d]	Mississippi River, upstream from Arkansas City	6175	10,000

Note: Revised discharge volumes received too late for inclusion in the DEIS are provided in the Project Description Technical Report (WCC 1980a). These changes do not substantially change any of the conclusions presented here.

[a] Depending on the final market configuration, the total discharge from all sites would not exceed 12,450 gallons per minute (gpm), or about 20,000 acre-feet per year, representing a 37.4-MMTA system.

[b] Potential proposed action site.

[c] Potential market alternative site.

[d] Potential Cypress Bend pipeline-barge alternative site.

CHAPTER 9

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

9.A OTHER SLURRY TRANSPORT MEDIA

9.A.1 HYDROCARBONS

Replacement of water as a transporting fluid with other candidate liquids such as methanol, crude oil, fuel oil, or liquefied petroleum gas was studied as an alternative. These liquids were eliminated from consideration because of their unavailability at the coal preparation sites. In addition, the processing of the fluids (except crude oil) requires large quantities of water. For example, methanol requires about 210 times as much water.

9.A.2 CARBON DIOXIDE

Carbon dioxide (CO_2) is becoming increasingly in demand for use in tertiary oil recovery processes, and according to the National Petroleum Council (1976), there exists a potential need for CO_2 in Louisiana. Thus its use as a transporting fluid was evaluated.

The estimated slurry loading would be 47 percent as-mined coal; therefore 42.3 MMTA of CO_2 would be required to transport 37.4 MMTA of as-mined coal. This is equivalent to about 112 billion standard cubic feet of CO_2 annually.

The alternative was eliminated because of the undeveloped technology of such a slurry mixture. In addition, any research being done is considered to be proprietary information and therefore is unavailable. Also, sources of CO_2 in the area are unknown.

9.A.3 TREATED WASTEWATER

This concept was evaluated and eliminated because of the unavailability of significant quantities of unappropriated wastewater.

9.B OTHER METHODS OF TRANSPORT

Truck transport was evaluated but was eliminated as being impractical for the large quantities considered here. Such a scheme would require 40,000 twenty-ton trucks to be on the road at all times, with a truck loading operation required every 45 seconds at each of the coal preparation plants.

9.C OTHER WATER SUPPLY SOURCES

9.C.1 RETURN WATER LINE

Water from the Mississippi River could be transported to the coal preparation sites for use in the slurry pipeline system. A water pipeline would have to be constructed adjacent to the slurry line, and matching centrifugal water pumps would have to be installed at the slurry pump station sites. The return water line was eliminated from detailed analysis because it would consume energy at the rate of 20,653 Btu/ton of coal, as well as requiring an additional 1,090 acres for construction of the return water line. This would result in additional disturbance and environmental damage.

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